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BESSEMER'S HEAVY ORDNANCE.

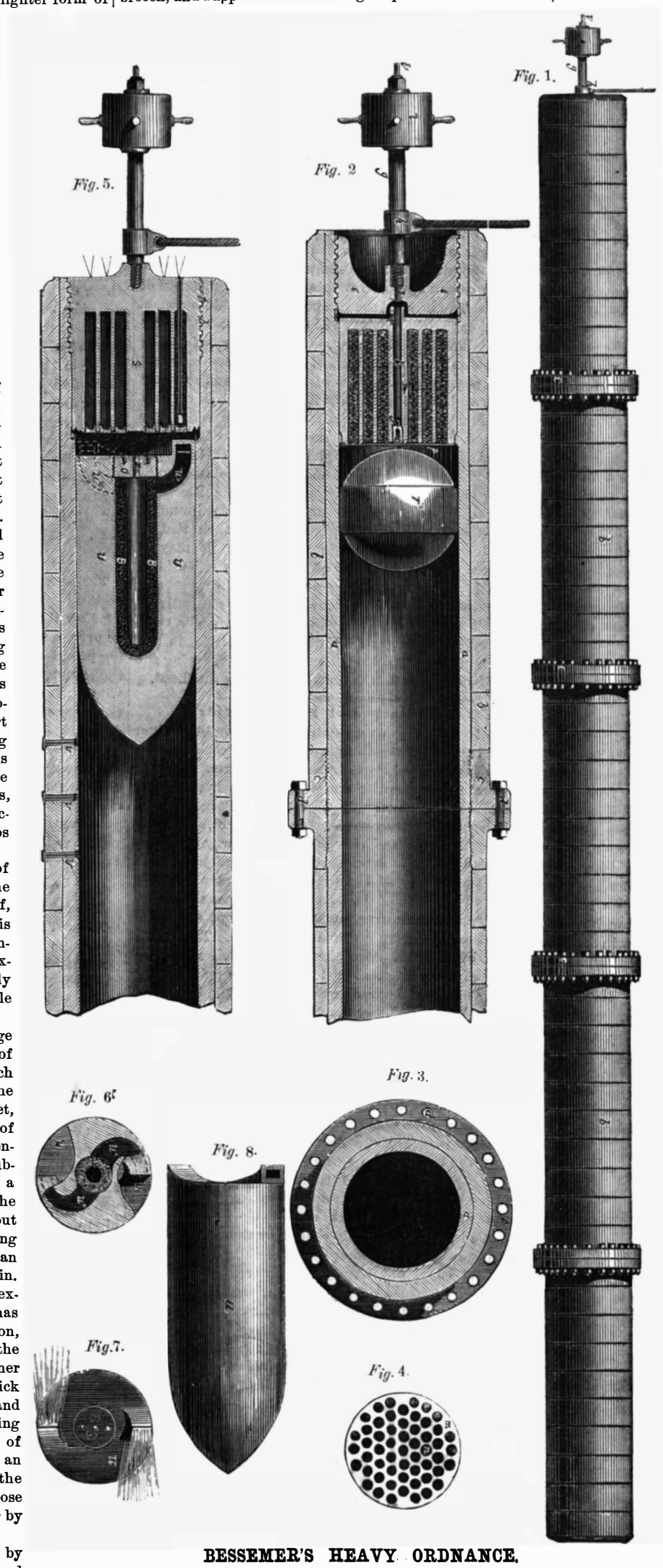
For some time past Mr. Henry Bessemer has been devoting his attention to the construction of heavy ordnance, and the development of a new system by which a weight of projectile may be fired far exceeding anything that has been yet attempted, combined, at the same time, with a lighter form of gun, requiring the employment of less metal in its construction. To achieve this end, he seeks to consume his powder charge in such a manner as to utilise the whole of its effective force, and, at the same time, to avoid throwing any sudden and excessive force upon the gun. Such a design affects, first, the construction of the gun, and, secondly, as a matter of course, the form of the projectile. Of the many arrangements which have been designed by Mr. Bessemer, and which have succeeded one another as he arrived more nearly to practical results, we have selected one of the earlier forms, reserving the publication of other and more advanced modifications till a latter period; and here we may remark, that Mr. Bessemer is at the present time having constructed a monster piece of ordnance which shall embody his latest designs, and the trials of which will subject his theories to the extended test of actual experience. In the largest description of rifled ordnance now in use, the sudden explosion of the heavy powder charge required to project the elongated shot is so great, that a thickness of metal at the breech, about equal to that of the bore, is required to resist the tendency to rupture the shock occasions. This necessity places comparatively confined limits upon the size of heavy guns, and the weight of projectiles employed. Again, the sudden energy called forth by the powder explosion which exerts so destructive an influence on the breech of the gun, decreases as the shot, acquiring velocity, moves along the bore of the gun, until, as it reaches the muzzle, the final pressure upon it is far less than that which originally started it into motion. To equalise this force then, and exert upon the projectile a constant pressure along the gun, is the first object the inventor seeks to obtain, and he anticipates reckoning the weight of shot, not by pounds but by tuns, which, with perhaps a somewhat low velocity, would, if fired against armor plated ships and forts, fall upon them and crush them.

But in so greatly increasing the weight of the shot, the inventor naturally increases the length of his gun, considering a barrel of, say, 50 feet in length, to be necessary for his purpose. In this barrel there would be generated a series of continued or repeated explosions, which would exert a comparatively low and equal pressure during the whole time that the projectile traverses it.

Thus, in the present system a given charge of gun powder may exert at the moment of explosion a force of 60,000 lb. per square inch on the chase of the gun, and by the time the projectile has traversed a distance of 10 feet, the pressure may be reduced to a mean of 15,000 lb. per square inch throughout the entire length. Mr. Bessemer proposes to substitue for this violent and unequal action a continuous force of only some 3,000 lb. to the inch, maintained upon the shot throughout the entire length of its extended travel along the bore of the gun, hoping to obtain an equivalent duty with a vastly reduced strain.

The engravings on the next page will explain the mode in which Mr. Bessemer has embodied his ideas. Fig. 1 is an elevation, Fig. 2 is a longitudinal section of part of the gun, and Fig. 3 a cross section. The inner tube of the gun may consist of several thick plates of iron, each bent into a tube and welded, the inner and outer surfaces being bored and turned so as to receive a series of steel hoops placed on hot, and exerting an interal force on the gun. At the ends of the inner tubes are flanged hoops for the purpose of connecting the several lengths together by bolts.

The breech of the gun may be secured by a movable breech plug screwed into the end of the tube, and made gas tight by an expanding metal elastic cup, forming a knife edge on the plug, and forced against a ring of copper or other soft metal let into a groove formed round the breech for that purpose. This breech piece is shown at *e*, having a knife edge. The removal of the breech piece is effected by the rod, *g*, fastened into the rear of the breech, and supported in a bearing suspended from a crane; a balance weight is fitted upon the end of the rod, having handles for the purpose of turning round the breech piece.



BESSEMER'S HEAVY ORDNANCE.

In order that a continuous supply of gas under pressure may be generated and made to act to on the projectile as it advances, a cartridge or powder chamber is provided, which fits loosely inside the gun; it consists of a cylindrical mass of steel, in which a large number of small holes or chambers have been drilled parallel to the axis of the gun. From 20 to 100 of these chambers are made according to the size of the ordnance, and vary from two to five inches in diameter. The explosive material is placed in these cells. By preference, Mr. Bessemer recommends the use in each chamber of a number of separate charges of powder, separated from each other by diaphragms having a fuze for communicating the ignition, or else parted by a thin layer of meal powder. The quantities of powder in these charges increase at every succeeding discharge of the series, and the intervals of time between the discharges diminish, so as to keep time with the increasing velocity of the projectile, and thus keep up the pressure in its rear nearly uniform throughout its entire movement from the breech to the muzzle of the gun.

In Fig. 2, the cartridge above described is shown in its proper position within the gun, as well as in end elevation, Fig. 4. In both these figures the cells which contain the powder charge, will be seen, as well as the diaphragms dividing the powder itself. Each of these diaphragms is pierced with a small hole, so that the charges are fired in rapid succession. The powder is ignited by percussion caps contained in a separate cell, *o*, fastened into the central part of the cartridge; and behind the cap is a small steel rod fitted so that it can be easily moved. In a line with this rod is a similar one, *l*, passing through *g*, so that on receiving a blow at its outer end it comes in contact with the former, and strikes the cap. The cells of the cartridge preserved from injury, and the charges are kept dry by a soft metal capsule covering the end of the chamber. As shown, the cartridge can be easily removed after it has been fired.

It will be understood that the powder in the various cells of the cartridge is ignited at the mouth of each cell, but they may be so arranged that the cells may be fired successively as the shot advances along the gun, and various means may be adopted for firing the charges, such as a central fuze communicating with each cell, or a suitable electrical apparatus actuated by the projectile itself.

In Fig. 2 is shown a nearly spherical shot, of a reduced diameter in one direction, where a portion has been cut away, so as to form a flat band around it. Thus, for a gun of 2 ft. bore, the shot may be 26 in. cut down to 24 in., as shown. The advantage of such a projectile over a spherical shot, is that there would be less windage, and that no rotation could be set up in the passage of the projectile through the gun, thus insuring a greater accuracy of fire.

In Figs. 6, 7, 8, is shown the elongated projectile proposed to be used by Mr. Bessemer, in which a part of the powder charge is inserted in the rear of the shot, or in an auxiliary chamber, to obtain rotation. In this arrangement a separate charge is placed in the shot, as shown, and the latter is provided with openings at the rear, tangential to the circum ference; the ignition of this supplementary charge at once gives additional impetus and rotation to the shot as it passes along the gun. The powder is placed in the recess at the rear of the shot, firmly compressed in it, and afterwards partially bored out, as shown, to insure such rapidity of fire that the whole may be consumed before the projectile quits ghe tun. The degree of rotation would of course depend on the amount of powder consumed, and the size and direction of the openings through which the high pressure gases escaped. As shown in the drawing, the central opening, through which the projectile is loaded, is closed with a plug bored out in the middle and fitted with a fuze, by which the charge is ignited from the first flash that pro.

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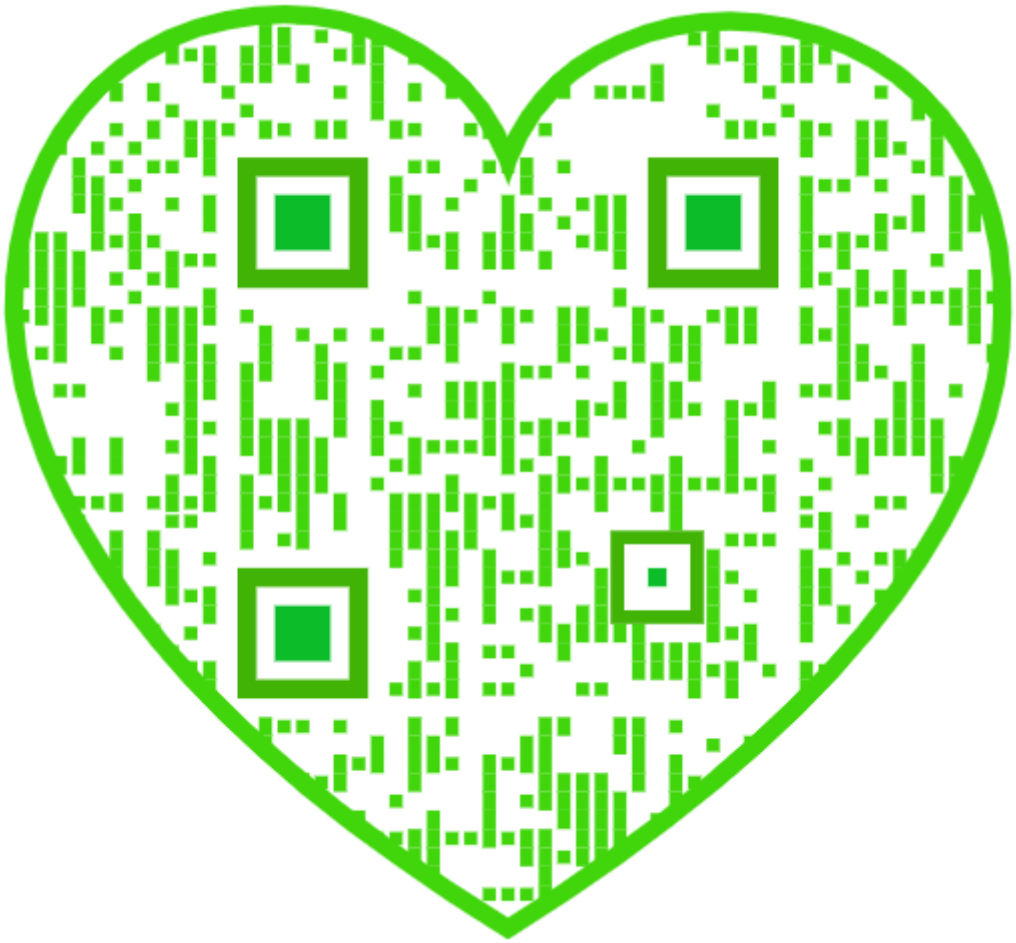

ceeds from the cartridge of the gun. We may now describe, in a few words, the means designed for maintaining a succession of rapid discharges from the cartridge by help of the projectile in its passage along the gun. At short intervals, along the chase of the gun, small holes are drilled in pairs, *v v*, into which insulated wires are are fitted. Both on the inside and outside of the gun, non-conducting screw caps are placed to preserve the insulation. The ends of the rods or wires stand sufficiently in relief on the inside of the gun to be touched by the projectile as it advances, and metallic contact between a pair is effected, and the ignition of a powder charge in a cell of the cartridge is effected by means of an Abel's fuze and a battery.' In this way, the whole of the cells may be discharged successively, and a comparatively uniform pressure maintained, while the shot traverses the 50 or 60 ft. of gun barrel, the maximum pressure being regulated, of course, by the amount of powder in each cell. This arrangement is shown in Fig. 5, where it will be seen that the cartridge forms the actual breech of the gun.

We refrain for the present from making any comments upon Mr. Bessemer's novel and very striking designs. They possess a vast amount of characteristic ingenuity, and will, if attended with success, effect a greater reform in the construction of heavy guns and armor than has yet been dreamed of. We shall have, however, to refer to the subject again and again, as Mr. Bessemer has effected many important modifications in his plans, and is engaged in perfecting the modes of mounting and operating his monster ordnance. Besides, as we said, he is now occupied in manufacturing a full sized gun, for subjecting his theories to the test of actual practice. —*Engineering.*

SCREW AND RIVET MANUFACTURE.

Condensed from Engineering.

Birmingham abounds in screw and rivet manufactures. At the works of Messrs. Nettlefold and Chamberlain, a patent process of manufacture is carried on. The screws manufactured by the firm are principally wood screws, but other threads are also cut; and they manufacture a quantity of screws for stove work and for reaping machines, as well as for other special purposes. The rivets made here are chiefly those adapted for light work, such as are employed by tinmen and coopers, and weighing from a few ounces to about 16 lb. per thousand. Up to a certain point the mode of manufacture of rivets and screws is similar, according to the process here employed. The first part of the operation for both classes of work is to cut the wire into the proper lengths, and to form the head. This, in the case of small work, is all done by one machine, and at one operation. Where comparatively thin wire is employed, the coil is simply hung over a wire attached at one end of the machine, one end being placed between the jaws of a feeder, but where heavier wire is employed, it is necessary to pass it through a straightener before allowing it to enter the machine. The feeder consists of two jaws, which close as they move forward, gripping the wire, and carrying into the machine, but separating as they move backwards, preparatory to making a second bite at the wire. The proper adjustment of this feeder is a matter of no small importance, depending, firstly, upon the required length of the screw or rivet; and secondly, upon the size and thickness of head required. The character of, and consequently the amount of metal required for, the heads of screws, especially those employed for ecclesiastical ornaments and other fancy work, varies so much that no especial rule can be laid down for guidance as to the additional length of wire that must be allowed for the purpose, and the proper setting of the feed motion, of the machine is therefore a matter which experience alone can properly regulate. The machine having been properly adjusted for feed motion, and suitable dies inserted for the formation of the head of the rivet or screw, it is set in motion; a crank action causes the feeder to draw in the wire, with a proper proportion of excess wire, for the formation of the head, projecting in front.

The jaws of the feeder now hold the wire rigidly while an eccentric action projects the head die forward from the opposite direction, stamping, or rather squeezing, the projecting wire in a head of the required shape and form at one operation. This done, a cutter, working sideways from the machine, severs off the now finished rivet, or screw stock, as the case may be. Another revolution of the machine causes a second rivet to be thrown out; and this goes on incessantly so long as the roll of wire lasts, the operation being perfectly automatic when once set in motion, and requiring but little attendance, so that one person is enabled to overlook several machines. Besides these horizontal machines, which will work with wire up to about half an inch in thickness, there is also at these works a vertical, or as it is there called, an "upright" machine, which will take wire of a much greater thickness. For this, the wire requires to be first cut into proper lengths by a suitable machine of simple construction. The machine consists of a bed plate, on which is a receptacle for the lower die or holder. On either side of this there is an upright, between which works a stamper in a suitable guide piece, at the bottom of which is fitted the upper die for forming the head of the rivet, and motion is given to it by an eccentric revolving on a shaft above, and which is driven direct by a strap from the overhead motion shaft. It is fed by hand. In both these machines the heads are made without heating the iron. The heads to which we have hitherto been referring, so far as screws are concerned, are those which are round, and flat at the top, to be afterwards cut across for screwdrivers. Many screws, however, require to be made square headed, for spanners, and these are generally forged by hand; but however neatly they may be made, it will always be found that there is a certain degree of irregularity in their shape, which renders it necessary to pass them afterwards through a shaping machine. Besides the great expense of this, it is found that the heating and cooling of the iron, during the forging of the head, reduces its strength, and that the heads of such bolts will sometimes give way when subjected to a severe strain. The screw stocks having now been completed, the next process is to smooth down the heads, and to give them the proper size and form. The machine for this consists of a revolving holder. into which the end of the stock is firmly fixed, so that the head will revolve between two cutters shaped to cut it to the proper form. As soon as the machine is set in motion the attendant draws up a lever which causes the cutters to close upon either side of the screw head. These, however, are firmly set so that they will not approach one another beyond a certain point, otherwise this operation would have to be very carefully effected, and the result tested with callipers; and even then, with the greatest care, the screw heads could not be so evenly made as they now are by these machines. After this, the stocks are placed into a hopper attached to another machine, from which, by a self acting motion, they are caused to slide down a slotted incline, at the bottom of which is a revolving vertical barrel, with circular cuts at intervals down its side; into these cuts the screw stocks fall one by one, with their heads projecting above the top of the barrel. They are then carried round beneath a small circular saw which cuts the nick in the head for the screwdriver, after which the stock is thrown out of the machine and carried away to receive the final operation of threading. The threading machines—which are worked exclusively by women and girls—require great accuracy in their adjustment, but when once properly set, it is impossible that there can be any deviation in the thickness of the screws cut. The cutter consists of two parts, a die, against which the screw revolves and a cutter which is pressed by a lever against the opposite side of the screw; and these are first so set that they cannot approach within the proper distance of one another. The head of the screw is first fixed into a mandril head, where a driver point enters the nick, and it is firmly held in position by a set screw. Of course a good deal of knack is required in this branch of the manufacture to get the cutter always into the trough of the screw, and so as not to cut the thread; but the greatest nicety—which is only acquired by great practice—is required when the screws are gimlet pointed. The packing of screws in paper is all done by hand, and with the greatest rapidity, the screws being put down side by side, alternate head and tail, by the two hands working together, each placing a screw with the head outwards, and rising row upon row until the required number —generally a gross— is completed. They are then tied up and labelled, and are then ready for the market. It may be here remarked that the breaking off of part of the heads of wood screws, which not unusually occurs, is owing generally not to any error in making the screws, as might naturally be supposed, but more often to the wire having received a twist in the operation of drawing. This causes a strain in the fibers of the metal, which too often cracks open, during the operation of gathering in the metal in forming the head.

An Involuntary and Perilous Ride.

A locomotive, running as an extra on the Hudson River railroad, arrived at New Hamburg from Poughkeepsie on Saturday, being stopped there by a telegram from that city in consequence of a singular and what might have been a tragic incident. Before the locomotive left Poughkeepsie, four little boys who were playing about the depot, supposing it was a switch engine, and only going a little way down the track, climbed stealthily upon the wooden guard just above the bumper on the rear of the tender. This guard is only six inches wide. Three of the boys sat down upon the guard, with their legs hanging over, and the fourth got astride of the iron link which protrudes from the bumper. They could not be seen by the men upon the engine, which moved off and continued increasing its speed until it was going at the rate of forty miles an hour, as was ordered. The boys were in a terrible situation. They dared not climb to the top of the tender for fear of losing their balance, and their cries were drowned by the noise of the engine. Over bridges and on the edge of precipices they were whirled, the tender surging to and fro, the dust filling their eyes and noses, and almost choking them to death, and entirely obscuring them from the view of the flagmen and trackmen who were passed. The locomotive was signaled at New Hamburg, Mr. Jas. Signor having seen the boys on the rear of the locomotive when it left Poughkeepsie. The poor little fellows presented a sorry sight, as they were covered with dust from head to foot. The boy who was astride of the link was unable to walk when taken off, his legs being awfully chafed by the motion of the engine. The hands of the other boys were blistered terribly, and the blood oozed out from under their finger nails, so tightly had they grasped the wood work of the tender. They were nearly exhausted, and could have maintained their position but little longer, when they would have been probably instantly killed by the fall. They were taken back to Poughkeepsie, where the incident had become noised about, and a large crowd of people was in waiting at the depot to see them when the train they were on arrived.—*National Car Builder.*

New Hydraulic Rotary Governor for Water Wheels.

This machine, being attached directly to the gate, secures direct, positive, and instantaneous action, and will control the speed of a wheel as effectually under heavy as under light variations, a result of great importance and never before attained. The governing device consists, in part, of a centrifugal pump, throwing a column of oil against a sensitive piston. This piston will sustain a weight just sufficient to balance the column of oil under any required speed, a given amount of weight always maintaining the same rate of speed. Attached to the piston is an adjustable spring balance, which remains at rest when the wheel is running at speed, and on any change of labor receives and weighs the amount of variation, indicating at once the amount of change of gate required to restore the speed, and, having control of the power which operates the gate, places it at once in position to maintain exact speed under the new condition of labor on the wheel. So rapid is it in its action that it can, we are informed, when necessary, be adjusted to operate the entire gate in eight seconds, when, if fifty per cent of the power used is simultaneously thrown off, the gate is placed in position to meet the changes in *four seconds*, and before hardly a perceptible change in the speed.

It is simple in construction, durable, reliable, and easily attached to the gate. When attached to any good turbine wheel, the speed cannot, under the heaviest variations, be accelerated so as to damage the most delicate machine.

* John S. Rogers, Treasurer, No. 19 John street, Boston, furnishes machines suited to any condition of labor or kind of water wheel.

Destructive Effect of Salt on Axles.

The London papers give accounts of several accidents on railways, occasioned by the fracture of the axles of salt cars. It appears that between the sound portion remaining and the outside of the fractured axle, the surfaces were quite smooth, presenting the appearance of having been severed by a sharp instrument. This peculiar effect is thought to have been caused by the gradual action of the brine on the metal, the heat at the boss favoring the evolution of chlorine from the brine, and its then combining with the iron to form a soluble chloride of iron. From the position of the defect, it was not discoverable by ordinary inspection; and whatever may be the scientific explanation of the peculiar destructive action which thus goes on in the axles of salt cars, the fact must be regarded as a very serious one, especially in view of the statement made, that on one railway alone, no less than seven axles of salt cars were broken while running, in a period of less than three months, and this out of a total number of about five hundred wagons, showing an enormously large proportion, as compared with the fracture of cars of any other description of rolling stock. To diminish this liability, the plan has been proposed that, in addition to requiring such cars to be provided with well constructed axles of good quality, it also is insisted that the date of their commencing to run be stamped upon the axles, and that a reasonable number of years be prescribed as the maximum of their being used.

The Wood Sawing Club.

The Lockport *Journal* contains the following practical suggestion:

"Now that the croquet and base ball season will ere long be over, we would suggest, in order that the muscle developing process may not stop, or that the amount developed by the summer's exercise may not lie dormant during the long winter months, that the base ball athletics turn their attention to sawing up the wood piles of widows and sick folks during the winter. The exercise is fully as healthful, is not so violent, dangerous nor tiresome as base ball, and we are sure the results will gratify a curious public fully as much, and we would prefer to give the 'score' of a wood sawing class to that of a base ball club, in our columns. What say you, gents? Physicians recommend young ladies to form walking clubs. This is a matter in which steps should be taken."

The Sun at Midnight in Norway.

The following paragraph is from the description of a scene witnessed in the north of Norway, from a cliff 1,000 feet above the sea:

"The ocean stretched away in silent vastness at our feet; the sound of the waves scarcely reached our airy lookout; away in the north, the huge old sun swung low along the horizon. We stood silent, looking at our watches. When both hands came together at twelve, midnight, the full round orb hung triumphantly above the wave; a bridge of gold, running due north, spanned the water between us and him. There he shone in a silent majesty that knew no setting. Combine, if you can, the most brilliant sunrise and sunset you ever saw, and its beauties will pale before the gorgeous colors which lit up the ocean, heaven, and mountain. In half an hour the sun had swung up perceptibly, the colors changed to those of morning, a fresh breeze rippled over the flood, one songster after another piped up in the grove behind us; we had slid into another day."

The Use of Trade Marks.

The courts are steadfast in their purpose to protect trade marks, and juries are ready enough in following the lead of the bench. The annexed, from the Philadelphia *Inquirer*, will interest manufacturers. The mark which was imitated was "Stark" in a semicircle, the alleged imitation being the word "Star" in a similar form, which the Stark Mills complained of as tending to mislead buyers:

"In the suit instituted in the Circuit Court of the United States, by the Stark Mills against the firm of Bailey & Cascaden, arising out of the use, by the latter firm, upon their seamless bags, of a mark alleged to be in imitation of the trade mark of the Stark Mills, the court some time since awarded an injunction to restrain the further use of the mark complained of; and on Saturday last a jury, to whom was submitted the question of the damages to be awarded to the Stark Mills for the violation of their right to their mark gave a verdict in their favor for $6,032."

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NEW APPLIANCES FOR WOOL SCOURING AND DYEING.

[Condensed from Engineering.]

Some very efficient appliances for facilitating the processes of wool scouring and dyeing have been recently brought into use at the Prospect Wool and Cloth Dyeing Works, Huddersfield, England.

The intention of Mr. Kirkham, the inventor, has been well carried out by Mr. Melling, of Rainhill, the engineer to the company, who has fitted up the machinery; and the ease and precision with which one man, or even a boy, can control all the movements that are required, while he remains quietly seated, would surprise those who have been accustomed to think that the old fashioned method of "stanging," as the hand process is technically called, is the only one that would rightly carry the wool through all its varied courses till completely dyed.

In addition to the "stanging," the usual way of operating involves much labor in the removal of the wool from pan to pan, and considerable waste of materials, as well as great loss of heat, all of which are largely rectified by the newly patented plan.

The wool during its treatment in the various liquors requires pretty continual turning over or "tossing" to insure the whole of the fibers becoming equally and uniformly impregnated, or cleansed, as the case may be, as it must not be allowed to become matted.

To do this by the ordinary "stanging" process, one or two men use a kind of pitchfork with a long and strong wooden handle, with which, and by the exertion of great force, they drag the wool up from the bottom of the pan as best they can, and stir it or toss it about in the liquor, using the handle as a lever, resting it upon the edge of the pan or vat as a fulcrum. The wear and tear shown upon the edge of the vat indicates clearly that this work is no slight matter. This work is also very trying, as the liquor is kept on the boil, by a fire below, all the time the process is being carried on.

The new engine consists of one steam cylinder, which is single acting only by steam. It is placed vertically, and is closed both top and bottom. The piston rod passes upwards through a gland in the top cover, and is attached to a heavy cast iron weight, to force the piston to make its down or suction stroke, after the steam has raised it to the top. The upward stroke, being the one by which the main work is done, is performed by the steam. The valves are actuated by very simple cam-shaped tappets, placed upon a vertical spindle, with which there is a communication from the working platform, so that by hand the position of the tappet may be varied as required. The engine is self acting when started, but is still under perfect control. It works but slowly, making three or four double strokes per minute, with about 40 pounds steam pressure. It is provided with a series of inlet and outlet passages, so that either atmospheric air, or liquor from any vat or tank with which it is in connection, may be drawn in on the downward stroke, and be delivered by the up stroke, according to the valves and passages which may be open. The valves to each are conveniently placed in a line, under the eye, and within the reach of the attendant, who can open one or more valves, as he pleases.

About 40 vats can be worked by one such engine, but in the case now under consideration there are but four scouring, dyeing, and washing vats, of wood, each 7 feet 6 inches × 6 feet × 6 feet, and three or four smaller ones, for preparing the dye liquors, the former being upon the ground floor, and the latter, placed about 6 feet higher than the others. Each of the dye vats has a cold water supply; a steam pipe and valve leading to the bottom, for boiling the liquor by steam from the boiler; a large outlet valve, by which the vat can be emptied quickly by letting the liquor run to the main drain or stream; and connection pipes to the engine. But another important fitting to these vats is a false bottom made of iron, finely perforated, which is so placed near the bottom of the vat, and there firmly held, that when air is forced into the space below it by the engine, it shall produce a certain and determined action upon the liquor, etc., which may be contained in the vat. The proper fixing of this plate has been a matter of considerable difficulty, as an imperfect action might either roll the wool into lumps, or perhaps leave the corners unmoved.

No. 1 vat is filled with water, say 1,700 gallons, and the steam is turned on to warm the water, during which time one of the workmen puts into the vat the scouring ingredients, which, according to the nature and condition of the wool, are judged to be necessary. This differs much from time to time, and needs the careful attention of the person in charge of such work, under whatever system it has to be treated. Then the engine is set to work with the air suction valve open, and the first discharge of air, which takes place on the up stroke of the piston, is passed into the bottom part of the vat, under the perforated plate, through which it rises through the whole volume of water, which it disturbs and turns about, like a wave of the sea over a rough and rocky shore. Two or three such strokes, discharging air under a pressure, as indicated by the pressure gage, of 25 pounds per square inch, serve to thoroughly mix the liquor and all the chemical substances which have been put into it. The air finds its vent naturally from the surface of the water, and has done its work. When this preparation has been made, the bale is cut open, and the wool is lifted by two men into the vat, either entire or in portions, as is most easy to them. The engine is again made to pump air into the vat, and ten or twelve strokes suffice to thoroughly shake out the wool, and drown it in the liquor, as though it were rags in a paper maker's rag engine. Steam is now admitted, and the liquor is made to boil freely till the oily character of the wool is wholly removed, by the perfect washing action imparted to the contents of the vat by the intermittent discharges of air from the engine, which, by its beautiful action, continually tosses the wool and the liquor in every direction without throwing it out of the vat. The scouring liquor thus used, is not, however, entirely exhausted of its chemical properties, and, being hot, is now allowed to run off to vat No. 2. The vats being on one level are soon equally full, and the engine is then, by a change of valves, made to draw off the liquor remaining in No. 1 vat, and to deliver it into No. 2, where it only needs to be strengthened by the addition of some fresh scouring materials; and, No. 2 vat is ready to receive a bale of wool to be treated as that in No. 1 has been; meanwhile the first bale of wool still remains where it was in No. 1 vat. It now needs washing or rinsing to free it of all the scouring materials. This is done by a rapid supply of cold water, and a pretty frequent tossing by air from the engine. When washed enough, in one or more waters, which are run off to waste, the wool is ready for the next process, which, in the operation we witnessed, was that of chroming." This chrome liquor is admitted to the vat from one of the preparing cisterns, which, are placed at the higher level, and it is diluted with water, and boiled up with steam, as the attendant sees necessary while at the same time the engine is made to toss the whole about, as in the previous parts of the work. After this "chroming" has continued its proper time, the former operation of passing the liquor to another vat is repeated, and the wool in No. 1 is left once more; this time it is ready for the logwood dye for making it black, or for any other color for which the previous process has left it fit. The dye liquor is supplied hot from its preparing cistern, as was the case with the chrome liquor, and when done with, it is in its turn also passed on to another vat, to be strengthened and used again, and so on. The wool is now ready for removal from the vat in which it was first placed, the process being complete.

There is little or no waste of heat in such an arrangement as this, and also little or no waste of dye liquor. Each quantity is passed on, from one vat to another, hot, and ready with a little help of new stuff, for repeated operations. The saving thus obtained is a very important item.

The result is, that the work can be turned out at a considerably reduced cost, notwithstanding the outlay for machinery, while at the same time a much greater uniformity of color can be produced, and with greater evenness throughout the whole batch of wool under treatment than by the ordinary method.

A special chemical action, in this system of dyeing, has much to do with the good result, arising from the extra quantity of oxygen imparted to the dye liquor from the blowing and tossing by compressed air.

This arrangement can be added without difficulty to any of the ordinary vats or pans now in use, thus rendering the application of the new system one within the reach of any person desirous of reducing the heavy hand labor of his works as far as possible.

The Manufacture of Russian Sheet Iron.

A particular kind of sheet iron is manufactured in Russia which seems not to have been produced elsewhere. It is remarkable for its smooth glossy surface, which is dark metallic gray, and not bluish gray, like that of common sheet iron. On bending it backwards and forwards with the fingers, no scale is separated as is the case with sheet iron manufactured in the ordinary way by rolling; but on folding it closely, as though it were paper, and unfolding it, small scales are detached along the line of the fold.

This sheet iron is in considerable demand in Russia for roofing, and in the United States, where it is largely used in the construction of stoves, and for encasing locomotive engines. It is there named stovepipe iron.

Russian sheet iron has been recently subjected to chemical examination in the metallurgical laboratory of the Royal School of Mines, and the analytical work has been executed by Dr. Percy's assistant, Mr. W. J. Ward.

The occurrence of a peculiar carbonaceous mass, left after the solvent action of dilute hydrochloric or sulphuric acid, may reasonably be accounted for, Dr. Percy says, by the method of manufacturing Russian sheet iron, which he describes. The sheets are interstratified with charcoal powder, and bound up in packets, each of which is subjected to repeated hammering. Hence, it is easy to conceive how fine particles of charcoal should be beaten in over both surfaces of each sheet; and, if this be so, a relatively larger proportion of carbon should exist in the thin sheet, as is the case. Yet, that some of the carbon is combined, may be inferred from the fact that distinct hardening occurs after heating the metal to redness, and immersing it while hot in water, and especially in mercury.

In the volume on iron and steel, which Dr. Percy published in 1864, he stated that the mode of manufacturing the Russian sheet iron in question was kept rigidly secret; that it was made from iron smelted and worked throughout with charcoal as the fuel; that, according to information which he had received from three independent sources, the sheets, after the completion of the rolling, were hammered in packets, with charcoal dust interposed between every sheet; and that they were subsequently assorted, and the outer ones, being inferior in quality, were thrown aside as wasters.

Our author has since found that the secrecy was more dependent on ignorance of the Russian language than on anything intentional; and he now gives various particulars of the process.

The manufacture of sheet iron in Russia, he says, is chiefly confined to the iron works on the eastern side of the Oural Mountains. The malleable iron, which is the subject of this manufacture, is derived from pig iron, obtained by smelting the following ores with charcoal in cold blast furnaces—namely, magnetine, carbonate of iron (*sphæro siderite*), and red and brown hematite. The conversion of the pig iron into malleable iron is effected either in the charcoal finery or in the puddling furnace.

The puddle balls, intended for the manufacture of sheet iron, are rolled into bars five inches wide and half an inch thick. The iron should be more crystalline than fibrous, and should contain sufficient carbon to render it more like steel than iron. The machinery required consists of one or two pairs of rolls and two kinds of hammers. Reheating is conducted in furnaces of particular construction. The rolls are driven by water wheels, and should make not fewer than fifty revolutions a minute. The hammers are also put in motion by cams on the axles of water wheels, The hammer heads are of wrought iron, with striking faces of steel. Each anvil consists of a solid block of white cast iron. It is necessary that the hammers and anvils should be so made, in order that they may have the requisite hardness, in default of which the surfaces of the sheets would not acquire sufficient brightness or polish.

The puddle bars, five inches wide and one fourth of an inch thick, are cut into pieces twenty-nine inches long, which weigh about 15·35 pounds avoird. (10 pounds?—J. P.). These pieces are heated to redness, and cross rolled into sheets about twenty-nine inches square, and in order to become thus extended, they require to be passed through the rolls about twelve or fourteen times. The sheets thus produced are arranged in packets of three in each, heated to redness, and rolled, each packet passing through the rolls about ten times. But just before rolling, the surface of each packet is cleaned with a wet broom, usually made of the green leaves of the silver fir, and powdered charcoal is strewn between the sheets.

The sheets obtained from this rolling are sheared to the dimensions of twenty-eight inches by fifty-six inches. Each sheared sheet is brushed all over with a mixture of birch charcoal powder and water, and then dried. The sheets, so coated with a thin layer of charcoal powder, are arranged in packets containing from seventy to a hundred sheets each; and each packet is bound up in waste sheets, of which two are placed at the top and two at the bottom. A single packet at a time is reheated, with logs of wood about seven feet long placed round it, the object of which is to avoid, as far as possible, the presence of free oxygen in the reheating chamber. The gases and vapors evolved from heated wood contain combustible matter, which would tend to protect the sheets from oxidation in the event of free oxygen finding its way into the reheating chamber.

The packet is heated slowly during five or six hours, after which it is taken out by means of large tongs and hammered. The packet is moved about so that the blows fall in a certain regular order. After this treatment the surface of the packet presents a wavy appearance, as the striking face of the hammer and the face of the anvil are both rather narrow. When the packet has traveled about six times under the hammer, in the manner specified, it is removed; and immediately afterwards, completely finished sheets are arranged alternately between those of the packet.

The actual cost of manufacturing these Russian sheets is about £12 15s. per tun, to which must be added general charges, which raise the amount to £16 or £17 per tun, exclusive of profit. The average price of sheet iron at the fair of Nijni-Novgorod is about £22 or £25 per tun.

Moving in Circles.

It is astonishing how some people move in a circle, and run round and round in the well worn ruts, without attempting to widen the one or step out of the other. They do things in a certain way because some friend or neighbor does so, without a question as to the propriety or fitness of their doing the same thing in the same way, whether the circumstances admit of it or not. We were forcibly impressed with this, not long since, while stopping a few hours in a flourishing town in one of the finest counties in Central Ohio.

On a fine broad street, there were no less than five or six residences, mostly on contiguous lots, built as nearly alike as possible, with the front door in each, in some unaccountable way, set obliquely into a corner at the end of a balcony running along the side of the main building, making a row of singularly awkward looking dwellings, and sadly marring the beauty of the street architecture.

Another case in point is that of a man now building a two story and basement house on a twenty foot lot. His heart is set on a "swell front," not because he admires the style, or that it is at all adapted to so narrow a house, but because his friends have built on that plan, and he does not wish to be singular. It is in vain the architect has assured him that a swell front—which we never see on a house too narrow for it without calling to mind a character in "Little Dorrit" who, as Dickens tells us, "was not so much a man as a sort of swelled boy"—will give to a house of that width a cramped look, and make it seem even narrower than it is, that a front of this style for a building not wide enough to accomodate it, savors of affectation, and is in bad taste. It is all in vain; the foundation is laid and the work goes on. The precedent has been established by one of his neighbors, and will be followed in more than this single instance by others who cannot be prevailed on to give up the cherished ambition of an "imposing swell front."—*Building News.*

A FORM of stereoscope, in which mirrors were used to produce the effect, was devised by Wheatstone, in 1838; but the stereoscope now used was invented by Sir David Brewster, in 1849. The former was known as the reflecting stereoscope; and the latter, in which lenses take the place of mirrors, is called the refracting or lenticular stereoscope.

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Improved Pressure Recorder.

An instrument that will record the pressure in steam boilers, gasometers, etc., and indicate it so that such pressure may be referred to the exact time at which it occurs, is one that, in our opinion, ought to form an adjunct to every steam boiler in use. Such an instrument would definitely settle the disputes as to whether boilers explode under undue pressure, or not, and would furnish legal evidence, that in many cases would be invaluable, in determining the negligence of boiler attendants.

The instrument shown in our engraving, Fig. 1, is a recording pressure steam gage. The pressure is received upon a diaphragm in the chamber, *a*, through the inlet, *c*. The diaphragm transmits motion through a sliding rod to the index finger, *b*, which moves a pencil point to or from the center of an annular ruled disk or card, the inner edge of which is numbered like the dial of a clock.

The dark lines, curving from the center of the card outward, towards its perimeter, separate the surface into divisions corresponding to hours on the dial; and the lighter lines between them, running in the same direction, indicate ten minute divisions.

The concentric lines indicate pressure in pounds, from nothing at the outer edge of the card, toward the center.

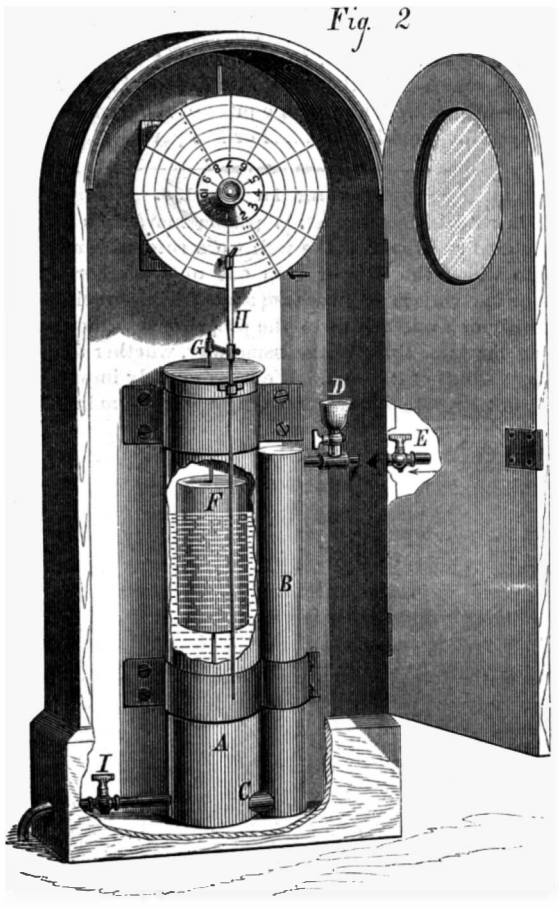
The card being revolved by clockwork, the pencil point, in the extremity of the index finger, makes a tracing on the card, showing the precise pressure indicated at any hour or minute of the day.

Fig. 2 is a modification of the instrument, designed to indicate the pressure of gas.

A cylinder, A, communicates with the cylinder, B, through a short pipe, C. Water is put into these cylinders through the funnel, D. The pressure of the gas is transmitted, through E, to the surface of the water in B, and causes the water in A to rise, carrying upward a float, F. From the top of a stem, attached to the float, F, projects an arm, G, which arm moves, upward or downward, the slender rod, H. The rod, H, carries a pencil point, which gives the tracing on the card.

The card is ruled with straight radial lines, instead of curved ones, as on the steam gage, Fig. 1, as the pencil point moves in a straight line instead of a curved one.

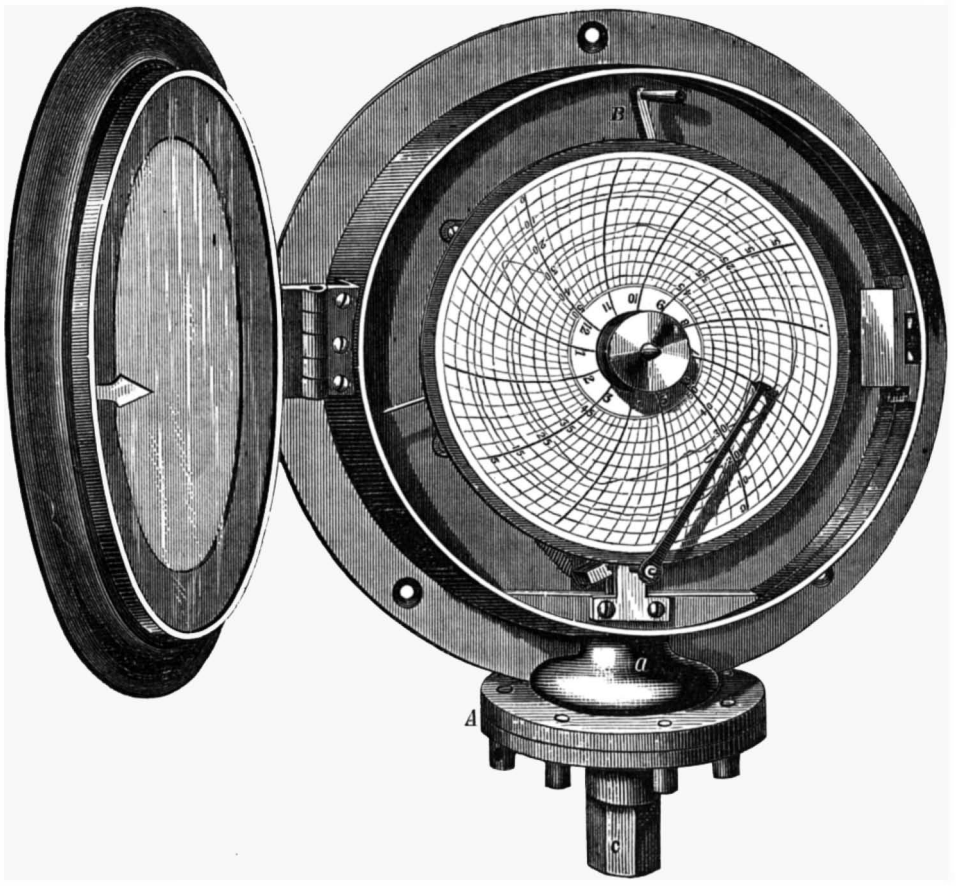
These instruments are simple, and are, no doubt, reliable. We consider their indications more valuable than those of instruments which simply trace a curve of pressure, without referring the variations from the established standard to the times at which they occurred.



For further information address D. P. Davis, 44 Courtland street, New York.

Reconstructing Old Dwelling Houses.

It is a common remark with those who have repaired an old dwelling house, that it costs more to reconstruct an old house than to build a new one. In some instances the saying is true, while in others it is not. The expense will depend on the sound or unsound condition of the old structure, the alterations to be made, and the management of the proprietor and the builders. In some instances, the structure to be rejuvenated is so different from what is desired, that the most economical course will be to tear the old building down at once, or remove it and appropriate it to some other purpose. If, for example, the siding and roof are old and must be renewed; if the rooms are not of the desired hight and size; if some of the timber has decayed, and the studs and joists are so far apart that the laths will spring between the timbers to which they are nailed, and thus fail to make a strong wall,—the old dwelling had better be demolished, as a new edifice can be erected more economically than such a shell can be satisfactorily reconstructed. On the contrary, if the frame is sound and the rooms of the desired form, new siding, new windows, new doors, and new walls can be substituted for the old ones much more economically than the old frame can be demolished and a new structure erected.



DAVIS' PRESSURE RECORDER.

There are two ways of repairing an old dwelling, one of which is expensive and unsatisfactory, and the other is satisfactory and economical. The expensive way is to let a builder take the job by contract, and agree in writing to do this and that as per contract. Of course, every professional builder knows enough to make an estimate that will cover all expenses and leave him a generous profit. Whenever a contract is drawn, builders are not always careful to note every minor item; and proprietors do not always think of every little job until it is too late to be noted in the contract. Such things cause difficulty. The builder of one of the college edifices of Cornell University was not obliged to make box window frames, and provide weights for the windows, as that particular item was not specified in the contract. So the building was finished without window-weights, as such appliances had not been thought of by the directors until the building was nearly finished.

The most economical way to repair an old dwelling is to employ a faithful and competent joiner to prepare a bill of such materials as will be required, and to do the work by the day. It may be well, also, to provide one or more assistants or helpers; but let the proprietor bear in mind, that, as the number of workmen is multiplied,—unless the superintendent is a judicious manager,—the expense will be augmented. As a rule, it is true that four men, working together at such labor as one man can do, will not acccomplish as much in one day as one man alone will do in four days. First, then, let a thorough examination be made of the structure, and let every alteration be plainly noted on paper, after which let a bill of items be carefully made out. For example, one or two sides of the dwelling will require residing. Estimate the number of feet, or the pieces required of a given length and width. If a box cornice or bracket-cornice is desired, let a correct estimate be made of every board, molding facia, bracket lintel, etc. If a verandah is to be erected, make a note of every piece of timber, cornice, flooring, and roofing; after which, let every article be brought on the ground, and the lumber stuck up or spread out in the sun to dry. One great fault in building is using lumber that is is only half seasoned. If lumber that has been sawn a year, or even four years, is spread out in the hot sun for a few weeks, it will shrink but little after being worked up in finishing a dwelling house. Floor boards in particular should be spread out at least four weeks on slabs or timber to keep to keep the ends off the damp ground; and every day they should be examined to see if they do not warp. The rounding or convex side should always be kept up. Clapboards should always be thoroughly seasoned before they are nailed in their places; as boards partially seasoned, when nailed at both edges as clapboards are secured will usually split during the seasoning process, and thus form damaging and unsightly cracks. As soon as the lumber is sufficiently dry, let every piece be dressed out ready for use; then strip one side of the structure, erect the verandah, put up the cornice, nail on the siding, and let the paint brush follow the hammer in close succession before newly dressed lumber will have a chance to get wet. By adopting such a plan,—"getting a good ready," and knowing what is to be done,—the expense, of repairing an old house, will be much lighter than if the various operations were conducted in a hap-hazard manner.—*Technologist*.

McKenzie's Improved Carriage Top.

In the construction of these improved mechanical arrangements applicable to carriage heads, which are made to open and close—such as the landau—the ordinary outside carriage head joint or jointed support is used, although in some cases dispensed with, this joint having, however, by preference, an action the reverse of that usually adopted; that is to say, the upper end is attached to a turning axis, which works on the pillar top or equivalent part of the carriage. To this axis lever teeth or other gearing is secured, which gearing is also connected to the cant rail, hoop stick, or equivalent, and likewise to a spiral or other convenient spring made of india rubber or other suitable material, the lower end of which spring is secured to the lower part of the pillar top. These parts can all be covered. The other end of the outside carriage head joint is provided with the same arrangement of gearing and spring, either in addition to or substitution for that at the top end.

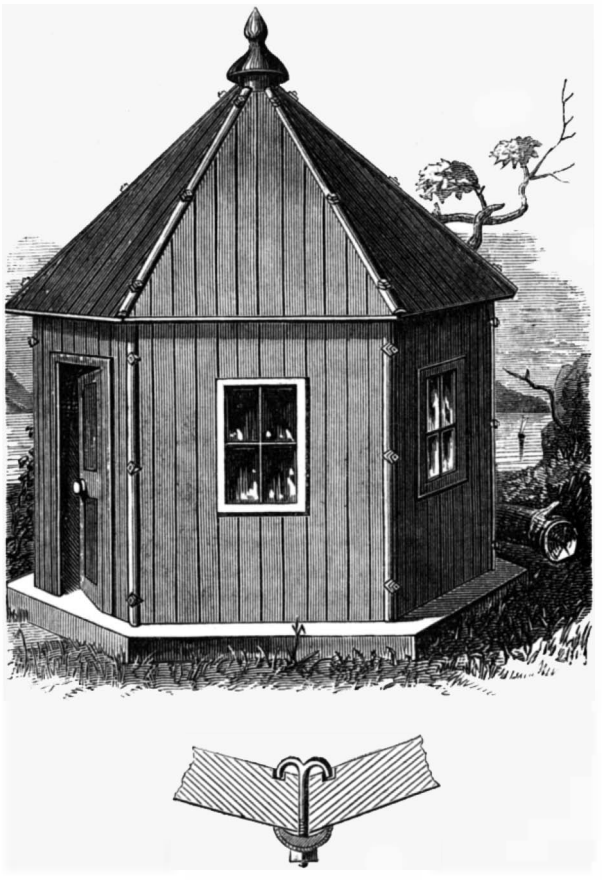
Ropes or chains and pulleys may be used to enable the head to be raised or lowered, or opened and closed, from the coachman's or traveler's seat. The opening and shutting or raising and lowering are effected without handling the jointed supports, as is necessary in the ordinary arrangements, by pushing or pulling the head in the usual way, except when the ropes and chains are used, when it may be effected by acting on them; but this will cause the carriage head joint or support to strike outward and not inward, as generally is the case; hence, when the carriage head has to be raised, it can be much more easily effected than by the ordinary arrangements.

Where carriage heads have side lights which can be slid along and dropped into the door, or otherwise removed out of the way when raising or lowering the head—such, for instance, as are sometimes adopted for the fore half of the carriage—modifications can be adapted and applied so as to dispense with the outside joint or jointed support, and, by covering all the mechanism, keep the same entirely out of view.

Mr. Alexander McKenzie, of Westminster, England, is the inventor of this improvement.

BAIN'S PORTABLE BUILDINGS.

The building shown in our engraving is intended for a



dwelling in the case of persons moving from one place to another not far distant—as laborers on railroad bridges, excavations, etc., are often required to remove. It is also intended for outbuildings for farmers, and especially tenants on farms. It is suitable for barns, stables, tool sheds, shops, granaries, smoke houses, and chicken coops; in short, for any purpose for which outbuildings are needed.

The buildings are constructed of boards or planks in side, and roof sections of any desired number, to suit the size of the building required. These sections are joined together to form the proper angles, and fastened in such manner as to obviate the necessity of framework or corner posts. The fastenings used are the same in the various sizes, and allow

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the angles, formed by the joined sections, to be increased or decreased, so that a section of a side, and a corresponding roof section, may be added to or taken from, the building without impairing its efficiency or affecting the strength of the fastenings.

Curved weather strips are applied to the outer portion of the angles, their shape permitting their adjustment to the angles in altering the size of the building, while they completely exclude the wind and rain, and also operate in connection with peculiar shaped bolts, which fasten them to the building, as binders, to strengthen and support the structure. The roof sections may be carried to a point, or a cone of sheet metal may be fitted at the summit, as shown.

The cone may be used as a ventilator or flue, in which case it should be made with a circular shaft, in order to more readily fit the roof sections to it, their points being cut properly for this purpose.

The building may be set upon any kind of ordinary foundation. To secure it at the bottom, if thought necessary, a sill or rail can be used.

The roof can be covered, if desired, by canvas or other material, but the inventor prefers to strip the joints with tarred or painted canvas.

The advantages of this kind of building are cheapness, portability (the pieces being light and few), the ease and facility with which such houses can be put together or taken down, and the capability of enlargement or diminution, nothing being needed but duplicate sections to enlarge as much as desired.

Patented August 8, 1871, by Francis M. Bain, of Delaware, Ohio, who may be addressed for further information.

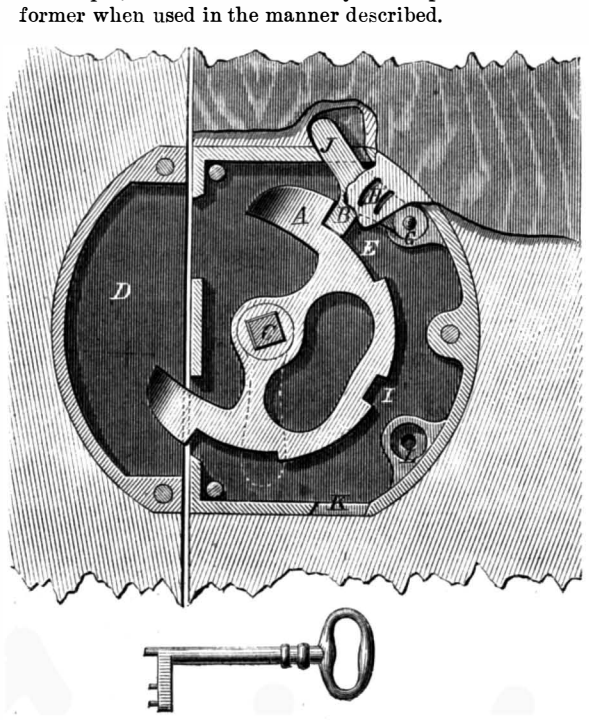
WARNER AND PAYNE'S DOOR LOCK.

This is a very simple lock, the bolt of which may be used either as a latch bolt, or as a lock bolt to securely fasten the door to which it is applied.

Besides the case, it consists of only two working parts, namely, the bolt, A, and the pawl, B, and the pivots on which they turn, all of which are cheaply made.

The bolt, A, which is in form something more than a semicircle, turning freely on its spindle, C, drops by its own gravity into the position shown in the engraving, and enters the keeper, D. In this position it may be turned by the knobs or handles on the spindle to a distance limited by the length of the notch, E, in which the pawl, B—also acting by gravity—enters, and with the shoulders of which notch the pawl engages.

This motion, however, is sufficient to release the bolt from the keeper, so that the knobs only are required to move the former when used in the manner described.



The pawl, b, turns upon a hollow pivot or cylinder, G, the opening in which coincides with a hole in the case of the lock. From the center of this opening, two segmental apertures, H, are cut through the case. The pod of the key enters the hollow pivot of the pawl, and the two wards enter holes in the pawl reached through the segmental openings, H. By turning the key thus applied, the pawl is raised, so that the bolt may be turned further round by the knobs on the spindle, and the pawl may enter the notch, I, the latter being made to fit, quite closely, the downward projection on the pawl. In this position, the bolt cannot be turned from the outside without the use of the key. The pawl, however, has a handle, J, from which projects a knob on the inside of the door, by the use of which the pawl may be raised and the bolt turned without the key. By making the bolt similar at both extremities and providing a second opening, K, for the handle of the pawl, and a proper pivot hole, L, for the pivot of the pawl, the lock is made reversible for right and left hand doors.

Patented through the Scientific American Patent Agency, Oct. 3, 1871, by Martin P. Warner and Edwin W. Payne, of Morrison, Ill.

Novel Uses of Electricity.

The efforts which have been made from time to time, with but poor encouragement, to engrave on metals by means of electricity, seem at last, says the *Iron Age*, to have resulted in the attainment of practical results. An ingenious French mechanic has produced an invention by which a metal plate, upon which a design is drawn with a chemical ink of some kind is slowly rotated with its face vertical, and several other similar plates, graded in size, are also slowly rotated by appropriate mechanism. The object of the invention is to engrave on the smaller plates the design traced upon the largest, on different scales of magnitude, which is accomplished by applying a cutting point to the face of each plate, and which is pressed against it by means of an electric current whenever a blunt point, applied to the large plate, encounters the ink in which the design is traced—the cutting points being at other times withdrawn. The point presented to the first plate is merely a "feeler," which determines by electrical agency whether the ink is beneath it or not. If it is, the points are pressed into the surface of the other plates; if not, they are withdrawn and prevented from cutting. The feeler and the burins must, of course, all follow a spiral track. This is crude, and can be made applicable to the reproduction of certain kinds of designs only, but it is considered a long step in the direction of practical success.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

The Psychic Force.

To the Editor of the Scientific American:

An anonymous writer from Jersey City, signing himself B. D., remarks in your last number, that the unearthing of the jugglery which I maintain to underly the manifestations exhibited by Home, requires "far deeper plowing than Dr. Vander Weyde has done in his letter of August 12."

I say so myself; but how can B. D. expect that I would be able thoroughly to unearth tricks which not only I had no opportunities to investigate, but which I have even not seen, and of which I know nothing except by description, in which, no doubt, many most important details were left out, and only such particulars were mentioned as served to apologize for the apparent credulity of the reporter, Mr. Crookes? His whole report is evidently one sided. He overlooked little particulars, which would, to a more competent expert than he proves himself to be, have given the key to the mystery of the whole performance.

When, some years ago, the Emperor Napoleon III. had seen Home's exhibition, he was full of astonishment at the wonderful feats he had witnessed, and invited, the next day, the eminent savant Arago to the Tuileries; and, after giving him a detailed statement of the performances, asked an explanation on scientific principles. "Sire," said Arago, "it is utterly impossible for me to give a satisfactory explanation of phenomena which I have not seen myself." I think this is an excellent rule, and I have since followed this example, and do not pretend to give a satisfactory explanation. All that I did, and intended to do, was to suggest some ideas explaining how such tricks might be done, and to call attention to the infinite resources offered to the initiated in the field of physical sciences.

B. D. makes one strong point out of the fact that Mr. Crookes saw Mr. Home change his dress, and therefore knows that there was no machinery secreted about him. Well, this only proves that the tricks were performed by means of contrivances not concealed on Mr. Home's body; or, after all, perhaps there may have been some machinery concealed in the clothes he put on—a trick of which I myself have been guilty. Mr. Crookes, it appears, was not enough of an expert to examine carefully every article of dress put on by Home, otherwise he would surely have mentioned this also.

Another strong point made by B. D. is the statement that the apparatus was arranged without Home's supervision. I ask, therefore: Who arranged it? Evidently, Mr. Crookes did not do it alone; his assistant, who looked under the table during the performance, says he saw certain motions of the accordion, and Mr. Crookes inserts in his testimony the existence of these motions, which he did not see at all himself. This has no value, it is not even legal testimony, as before a court you may not swear as to facts you know only by hearsay. I have my strong suspicions that there was collusion between Home and Mr. Crookes' assistant; this is another trick of which I myself confess again to have been guilty often: but Mr. Crookes is too confiding and too innocent to cherish any such suspicions.

B. D. thinks I am "attributing to Mr. Crookes, and the two other gentlemen, an amount of obtuseness that is not characteristic of either of them." B. D. must profess little knowledge of human character not to know, or never to have observed, that many men, very intelligent and of sound judgment in almost all respects, are obtuse, and even stupid, in certain peculiar matters—for instance, in their religious tenets, or in their political convictions. It has even been asserted that most men are insane on some particular subject, and it is surely true of a great many I know; they rather believe in a mysterious supernatural agency, acting in an absurd, nonsensical manner, than in the well known natural laws and forces, acting always consistently and wisely, and of which those who are more acute than their fellow men take advantage to deceive them.

Certain men will profit by the general love for the mysterious, by the universal predilection for believing in what is liked best, without investigating what is strictly true, and by the general disgust of people in being told that they err in judgment. This last fact is the strong point which maintains the belief in supernatural agencies. Men, in general, are not ashamed to complain of their bodily defective constitution, and even their mental deficiences in regard to memory, etc., but never in regard to their judgment; this is infallible, in their own sight. Therefore, when you tell them that they erred in judging about the so called spiritual manifestations, and that they were totally mistaken in ascribing them to the mysterious agencies, the belief in which they so dearly cherish, you will find that there are very few who will ever forgive you.

I will only add, as a proof for the necessity of witnessing such performances in order to explain them, that I was at a total loss to explain the feats performed by the Davenport brothers, as long as I only had heard of them by report; but as soon as I saw their performance, at the Cooper Institute in 1864, it was not only all clear to me, but I performed myself all their feats, before many witnesses, when no public performances were taking place. As at that time I lived in the Cooper Institute building, I had access to the hall in which their box or closet remained, and in which they performed every evening. I had, therefore, for some two weeks, a good chance to practice, and soon became as expert in all their feats as the genuine original performers themselves, and must declare that I since have remained utterly astonished at the obtuseness of the audiences which nightly paid their money, and believed in supernatural agencies to account for so clumsy and stupid deceptions. The only way by which I can account at all for this fact, is the consideration that the very great majority of those who came there, are prejudiced in favor of the reality of supernatural agencies; they expect and they wish to see them, and therefore get what they wish. Luther gave proof of his deep knowledge of human nature when he said: "Just as you want your mental belief, so you will get it."

P. H. VANDER WEYDE.

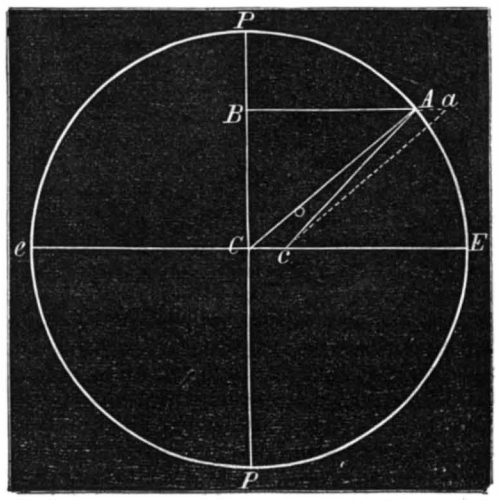
New York, Sept. 27, 1871.

Variation of a Plumb Line from the Perpendicular.

To the Editor of the Scientific American:

In looking over a file of the SCIENTIFIC AMERICAN, I find in your issue of January 14, 1871, a discussion relative to the tendency of a plumb line to vary from the true perpendicular, as is found to exist at the central shaft of the Hoosac tunnel. A mathematical demonstration by J. E. Hendricks, of Des Moines, Iowa, is there given, which I think can be shown to be incorrect both in principle and in the result.

Let P, E, P, e, be the earth; P, P, the axis; E, e, the equator. As the earth revolves upon its axis, every place on its surface, except at the two poles, describes a circle; thus a body, placed at A, will, in one revolution of the earth, describe a circle, the semidiameter of which will be A, B, perpendicular to the axis, P, P. In like manner; C, E, is the semidiameter of the circle described by the revolution of a place at the equator. But C, E, is the semidiameter of the earth, and A, B, the cosine of the latitude of the place, A. By the "Laws of Central Forces," when the periodic times of a revolution are equal, the centrifugal forces are as the radii. Whence a body at E has its centrifugal force as much greater than at A as the radius C, E, is greater than the radius A, B. Consequently we have this universal rule: The centrifugal force



at the equator, is to the centrifugal force at any other place, as the radius is to the cosine of the latitude of the place.

With the foregoing explanation, we come direct to the question at issue. Required the point toward which a falling body will tend, at the mouth of the central shaft of the Hoosac tunnel in 42° N. Lat., the centrifugal force at the equator being to the force of gravity as 1 is to 289. 1. As radius: to the cosine of 42° :: is 1, (the centrifugal force at the equator): the centrifugal force at 42° N. Lat. = 0·74314.

Hence the force of gravity at that point is to the centrifugal force in the ratio of 289 to 0·74314. To construct the problem geometrically, draw the dotted line, A, a, (representing the centrifugal force and its direction), so that it shall have a proportionate length to line A, C, (representing the force of gravity and its direction), as 0·74314 is to 289; draw the line, a, c, parallel to A, C, and c will be the point to which the falling body will tend, along the diagonal, A, c. c will be a point on a semidiameter at the equator, drawn parallel to a tangent at the equator, where it is intersected by a meridian of the place of experiment. 2. To find the angle of variation from a true perpendicular: The line, A, a, equals C, c, the angle A, C, c, equals the latitude of the place of experiment, 42°, therefore, as the logarithm of 289 is to the logarithm of 0·74314, so is the sine of 42° to the angle required, which = 5′,55·095″

To find the amount of deflection at the bottom of the shaft it being 1,030 feet deep. As radius is to the sine of 5′,55·095″, so is the logarithm of 1,030 to the distance, which = 1·7722 feet in the direction of the centrifugal force.

The foregoing demonstration is based on the supposition that the earth is a sphere, and the place of experiment at the

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level of the sea, but the earth being spheroidical in form, and the place in question some thousand feet above that level, will change the result here given. Knowing the difference between the polar and equatorial semidiameters, the ordinate A, B, corresponding to any required degree of latitude, can be readily found, to the length of the ordinate thus found, all the hight above the sea level; then instead of using the formula as radius is to the cosine of the latitude, say as the logarithm of the equatorial diameter, in feet, is to the logarithm of the ordinate A, B, plus the hight above the sea level in feet, so is 1 to the centrifugal force at A, which will slightly alter the fraction from what is before given, representing the centrifugal force at that point; thereafter, in the solution, follow with the proportions as before given.

Corning, Mo. HORACE MARTIN.

Facts and Figures Regarding Steam Boiler Explosions.

To the Editor of the Scientific American:

In your issue of September 23, John Lynch, M.D., Professor in South Carolina University, is very severe on the profession of which I am a humble member. He says that "the world looks to the practical engineer for an explanation of the causes of the frequent steam boiler explosions. But the recent examination of the so called experts shows that the world (and, no doubt, the experts also) has been deceived," etc. I must differ with the learned professor. The practical engineers who testified, among whom is Mr. McMurray, have shown that the boiler of the *Westfield* exploded simply because it was not strong enough to resist the internal pressure of the steam. It is true that the said experts used the opportunity to ventilate their mysterious theories, and let off the gases with which their boilers are charged; and even the learned professor seems anxious to add to the number of "probabilities" which are so injurious to all calm and candid investigations. In this age of scientific inquiry, it is certainly strange that even educated men should cling to the superstition of the middle ages, as they evidently do, from the love of the mysterious, which enables thousands to accumulate wealth as astrologers, mediums, and quacks. So great is this love of the mysterious that I would not be astonished to find at some future investigation of boiler explosions, the newly discovered psychic force act an important part. We are told that this is a latent force, possessed by many (unknown to themselves), a force able to suspend a man in mid air, and move the heaviest furniture; and no doubt it is the cause of earthquakes and boiler explosions.

The only reliable manner of investigation is to carefully examine the results produced under various circumstances, and thence to find the common cause. To do this, I will take for investigation two explosions with which I am familiar in every detail. The first was the most disastrous explosion that has ever come under my personal notice. A kier, about four feet in diameter by ten in hight, situated some fifty feet from the boiler, and connected with the same by an 1½ inch pipe, had a safety valve, 2 inches in diameter, and was filled about eight feet with woolen yarn and water. The steam pipe entered near the bottom of the kier, and ended near the center of a cast iron pipe called the "vomit" pipe. After the whole of the water was heated, this vomit pipe ejected water and steam on top of the yarn, in the same manner as the patent wash boilers vomit the water from the bottom over the clothes. This kier exploded with terrific force, carrying destruction to every building within 100 feet, and projecting the upper part of the kier like a rocket into the air, the bottom separating from the cylindrical shell. I have never seen a more complete ruin. Buildings were shattered, walls thrown down, roofs and rafters torn off, and houses and trees in the vicinity covered with yarn of all colors. Now here, certainly, could be no hydrogen gas, still less free oxygen; and certainly not even red hot plates to ignite the compound. There could be no low water, no overheated plates. No camel's back expansion; no water overcharged with heat while in a quiet state; no sudden evolution of steam, no electricity, although there might have have some psychic force. What caused this kier to explode? Overpressure! What caused the immense destruction? Instantaneous relief of an immense power! I am sorry I cannot gratify the love of the mysterious; but facts are stubborn things. The safety valve was choked with woolen yarn; and every bleacher is familiar with the trouble, in all kiers, of swelling by the steam getting under the cloth or yarn, and raising the same bodily. Now this kier was built to stand thirty pounds pressure, and when the vomit pipe discharged freely, any overpressure should have been relieved by the valve; but the kier swelled, the safety valve was choked, the pressure rose, and the weakest part gave way, opening the whole bottom, containing an area of 1809½ square inches, which, at 30 pounds pressure, would give a force of 54,285 pounds on the bottom, and a reactive force to lift the kier of 27,142½ pounds. The whole power stored up in the kier, if expended in one second of time, was equal to 345,600 horse power, certainly sufficient to cause all the destruction accomplished.

The second case happened within one mile of the first. It was the explosion of a 125 horse power Miller's safety boiler, and consisted of fifteen sections, each of twelve three inch tubes, which were connected with the water and steam main by two one inch pipes each. This boiler supplied steam for a 200 horse power Corliss engine, carrying a load, as near as could be ascertained, of 180 horse power; it had a grate surface of 11 ft. 6 in. by 5 ft., or 57½ square feet, with an extraordinary good draft. The engineer, an honest, intelligent man, stood near one of the fire doors when one of the tubes burst, the weld opening for about twelve inches. The result was a discharge of steam which partially extinguished the fire, with a hissing noise, but not the slightest damage either to life or property. On taking out the sections, it was found that seven had been injured by fire, and it was perfectly evident that they were exposed to a severe fire with little or no water. These are the facts. The pressure at the time of the explosion was 80 pounds. We ask why no serious damage was done, and find an answer in this: Each section was connected with the rest by two one inch pipes, giving an area of one and a half square inches, or a force of 120 pounds, with a reacting force of 60 pounds, not sufficient to displace any part of the structure. Here we have low water, red hot plates or tubes, sudden expansion of metal, favorable provision for the formation of hydrogen gas, and all the mysterious conditions for a first class explosion; why not the disastrous results? Simply because the relief of the power stored in the boiler took too much time, and time is an important consideration in estimating power.

If it is your good fortune, Mr. Editor, to open a bottle of champagne, with a friend or two, and let the stopper pop, you have a *bonâ fide* explosion; "the act of driving out any thing with noise and violence." If you drink one alone, and wish no one to hear the noise of the explosion, insert a tubular corkscrew provided with a pet cock and relieve the gas gradually; if no such corkscrew is handy, keep your hand on the stopper, and so let out the gas and prevent an explosion. If the bottle be weak, and you have the stopper secured by the wire, a sudden shaking, particularly when a little warm, will cause a "burst; to break suddenly." If you drink too much, you are "on a burst," because some people in that interesting condition break things suddenly, although I suppose editors never do.

Steam boilers, as other things, become weak by wear. They grow weak sooner when forced, when bad water is used. when they are irregularly fed, or when they are carelessly managed. In fact, the occasional reports of the Hartford Steam Boiler Inspection and Insurance Company tell the whole story. For July, 1871, they report "Furnaces out of shape, 33—6 dangerous; fractures in all, 40—19 dangerous; burnt plates, 50—16 dangerous," etc. Boilers may be, and often are, so faulty in construction that some of their parts have to resist a greater strain than they are able to sustain, as may be seen in boiler works where some difficult parts are often forced into position, and at times are split and rejected, but more often made to answer. There is no mystery as to the cause of boiler explosions, and there is a simple remedy. All modern ships are built in compartments, so that injury to one does not impair the efficiency of the rest; and we must do the same with steam boilers. There are many such in the market, and there are some that combine an economy never before reached with absolute safety. They are appreciated by manufacturers, and some of the largest of them, such as the A. & W. Sprague Manufacturing Company, who are using over 100 steam boilers, are now putting in safety boilers, as much on account of their great economy in fuel as their safety from disastrous explosions. One firm in Rhode Island manufactures now over 300 horse power of safety boilers per week, and has orders on hand to last till January. Ferry boats and steam ships must soon follow. And the world will be forced to admit that engineers, even if not perfectly familiar with modern chemistry, have conquered steam and made it safe and cheap.

JOSEPH A. MILLER, C. E.

Boston, Mass.

Testing the Purity of White Lead.

To the Editor of the Scientific American:

On the 18th of March last, you were kind enough to publish a test of the purity of white lead by use of the blowpipe, sent you by me over my own signature. A short time after its publication, a criticism of it appeared in your columns, signed by "X," of Pittsburgh, Pa.

I did not at the time deem it incumbent upon me to notice the criticism—if it can be so called—first, because the writer did not see fit to sign his own name, as in all fairness he should have done; and secondly, because I did not consider that to a reader of ordinary care, it really called in question the correctness and certainty of the blowpipe test, but only stated that the writer had once made an experiment in another and entirely different manner from that directed by me, which experiment had proved a failure.

My attention has, however, been recently called to the fact that the communication of "X" has been made use of (I trust without his knowledge) in trade circles, in such a manner as to make it appear as a partial refutation of the test, so I am induced to ask again the use of your columns to reply, which I will do as briefly as possible.

In my description of the test, I did not state that carbonate of lead would or would not reduce to its metallic base when heated in a crucible, so I cannot see that the gentleman's experiment has any bearing upon the test whatever. What I did state, and what I now beg to reiterate, is simply this: That a sample of pure carbonate of lead (white lead) when exposed, upon a piece of charcoal, to the action of the "blue" or hottest part of the flame of the blowpipe (in chemistry the word "reducing" is used, it being, in the use of the blowpipe, synonymous with "blue" or "hottest") will quickly part with its carbonic acid and oxygen.

I will also say that it makes no difference whether the sample be dry or in oil (except that in the latter case it will reduce a little quicker, as the oil helps it) whether a long or short time has been consumed in its corrosion or manufacture, whether it has "age" after manufacture or not, or by whom or by what process it has been converted into a carbonate.

But if a sample be adulterated with oxide of zinc, sulphate of baryta, whiting or other carbonate of lime (the usual adulterations), it cannot be reduced, because the adulterations cannot, by any heat obtainable with the blowpipe, be reduced to their own metallic bases, and cannot, of course, be converted into metallic lead.

The test is simply the adaptation of long and well known chemical facts to a beneficial commercial use, and I have not heretofore claimed and do not now claim more for it. As I fully realized its importance, and anticipated the probable effect of its publication upon the trade in imitation and adulterated white lead, before writing it I had applied it to many and various samples of white lead, both of American and foreign manufacture, of various "ages," and its results were in every instance confirmed by my tests or analyses in the "wet" way.

It will be found equally useful in detecting adulterations in litharge, red lead, or orange mineral, the latter being simply a superior article of red lead.

If "X" instead of setting up a test (?) of his own, and then proceeding to knock it down, will consult any analytical chemist as to the truth of the test, or will make the test as directed in my description, he will certainly be at once convinced of its correctness and reliability; and this course I would recommend to any one interested in the matter.

I will not again trespass upon your valuable space to reply to an anonymous communication on this subject, and I thank you for your indulgence in this instance.

St. Louis, Mo. FELIX MCARDLE.

Exit Mr. Paine.—He Declines the Challenge for a Test of His Electromotor.

To the Editor of the Scientific American:

Barnum, in his "Forty Years Recollections," relates his purchase of Peal's Museum, and the running of it in opposition to his other museum, the abuse of each other, growing out of their simulated rivalry, resulting as a profitable advertisement.

Now, I desire to assure you that there is no collusion of this kind between Mr. Smith and myself. I do not remember to have ever met the gentleman, and, as far as I am concerned, he is a Mr. Smith seeking knowledge under difficulties.

Mr. Smith, feeling uncomfortable in his "ridiculous position," attempts to make a diversion by citing certain alleged violations of contract on my part. I am at a loss to conceive what relation my private business matters may have with the subject matter under consideration, but Mr. Smith undoubtedly has an object in view, and in courtesy to him I proceed to state, that he has not seen, neither has any one seen, such a contract as he specifies in his seventh paragraph, for the very good reason that no such contract, *expressed* or *implied*, ever did exist, and furthermore, my name cannot be found as a party to any contract where it is not expressly stated that the enterprise is experimental, and to be solely under my supervision. Therefore, the remarks attributed to me in Mr. Smith's eighth paragraph are the coinage of his own brain, as they are predicated of a condition of things that had no existence.

Mr. Smith's closing proposition amounts to just this: "Mr. Paine, I bet you five hundred dollars that I can flog you; now if you don't step out and let me try, you must consider yourself flogged." Mr. Paine respectfully declines to accept this sportsman's bluff, and does not fear to let the matter be an open question.

To Mr. Smith and others, who have attempted to cast odium on my experiments, I have already given too much notice. Hereafter I propose to allow these gentlemen to continue their defamation of me as may please them. At the proper time my work will show for itself.

H. M. PAINE.

Selenitic Mortar.

To the Editor of the Scientific American:

We live and learn, and the present teachings open wide our eyes in astonishment. Under the head of "Selenitic Mortars," in your issue of the 26th ult., I discover that there is something new under the sun, and learn, for the first time, that sulphate of lime added to mortar renders it hydraulic. I again repeat, we live and learn, as I am told to believe that such is the case. However, my experience tells me, that plaster of Paris, in its natural state, will not render any lime hydraulic. This is easily proved. However, if any one doubts my assertion, I call upon him to make an artificial hydraulic cement out of a pure lime. I should first get rid of the sulphate in any ingredients I might have to use (pumice grit, for instance, for the cementing material therein is pure sulphate of lime) by "roasting," and I should add an ingredient containing alumina and the oxide of iron. Soapstone would answer; but, better still, any clay containing those two ingredients, and which is very abundant all over the world. This has, however, to undergo a certain preparation, which I thought was known only to the writer; and then I should proceed in my manufacture as Colonel Scott, R. E., has done. I may remark, that in 1840 to '45, I built many bridges and culverts in Matwa, India, of cement thus formed; and in 1846–'47, I laid the artificial foundations of the Aden defensive works with coral lime (the purest of lime), rendered hydraulic by the admixture of pumice grit deprived of its sulphate; I found in Aden that if this sulphate was not got rid of by "roasting," there was no hydraulic property whatever. We all know for internal work (decorations) plaster of Paris is used, and that it alone is very quick setting. I admit, any lime may be made selenitic by Colonel Scott's process; but that that alone will render any lime hydraulic, I cannot admit. The secret is the burnt clay. If nodular lime stone be procurable, calcine it, *without* washing, and you have an hydraulic cement, unless the clay

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in the nodules be over abundant; and this was the origin of my cement in 1840. As the result of my observation, I wrote an article on this subject in the *Country Gentleman* of March last.

J. KILNER,
Major-General Retired List, Royal, late Bombay, Engineers.
Fredericton, New Brunswick, D. C., Sept. 19, 1871.

A Leaf from a Practical Engineer's Experience.

To the Editor of the Scientific American:

I sent you an account of a circumstance which happened while I was running a portable engine, which you printed in an early number of last volume of the SCIENTIFIC AMERICAN.

I mentioned that in about four seconds the steam rose from eighty to one hundred and forty pounds. The safety valve would never, of its own natural action, have saved that boiler. I was looking at the steam gage at the moment that it began to indicate more pressure, and I raised the valve lever as high as the construction of the connections would allow, till mud and foam rose high in the air, and the pressure came down to the running point.

After reading of the *Westfield* explosion, and the opinions of your correspondents, I came to the conclusion that it is high time that something was done for the safety valve. It is in the same condition now that it was in seventy years ago. We need a valve that will rise two or three inches out of its seat in one moment, so as to give full relief before the pressure has time to get to a bursting point. That valve might be set so that it would not act unless there was positive danger. It might be constructed with what I will call the first load direct on the valve stem, without a lever. I would continue the stem upward, and connect it with a loaded lever or a spring that might be held down with a catch that would be let go with the first motion upward of the valve stem. It would almost entirely do away with the idea that if part of the fire surface gets red hot, and the water rises over it while in that condition, that there must be an explosion. If there are any weak points in my plan, I hope your correspondents will let me know them, so that the public may find out whether there is any means of reducing the number of boiler explosions.

San Francisco, Cal. JOHN MAILER.

Controlling Balloons.

To the Editor of the Scientific American:

While experimenting with a magnetic needle and observing the well known fact, that when the needle is thrust through any solid body and delicately poised, the attraction of the needle is strong enough to turn the body toward the north, it occurred to me that this principle of the needle might be applied to aid in guiding balloons.

Aeronauts have vainly sought for some contrivance for guiding, or preventing the rotation of the balloon. Now, suppose we construct a powerful magnetic needle, or bar, long enough to pass through and project from each side of the balloon; as the slightest influence will rotate a balloon or any other body when suspended in still air, or in a steady current of air, the magnetic bar would keep one side of the balloon toward the north, and other appliances could be used to drive it in other directions.

Hartford, N. Y. JOHN H. MARTIN.

Baltic Sea Soundings---Results of a Recent Exploration of the Baltic.

The greatest depth of the Baltic between Gothland and Windau as reported by the discovery ship *Pomerania* was found to be 720 feet, not 1,000, as was formerly supposed. At the depth of from 600 to 720 feet the water was, at the end of July, very cold, the thermometer giving from ½ to 2° R. No plants were found at this depth, and only a few specimens of one or two species of worms were brought up with the clay and mud. The cold probably prevents fresh water animals from living at such a depth, while the small quantity of salt which the water contains renders it unfit to support sea animals. Animal life abounds from the surface to about 300 feet below it, while plants were seldom found at a depth of more than sixty feet. The Baltic is supplied with salt water by the Cattegat, through which a deep water current flows into the Baltic, while the brackish water which is lighter, streams into the North Sea by a surface current. In the part of the Baltic which lies to the west of Rugen, the difference between the brackish water of the surface and the salt water of the depths is far more strongly marked than in the eastern basin, and consequently a number of animals and plants are to be found in the former which are entirely absent in the latter part, where the water contains a comparatively small percentage of salt. Both animal and vegetable life were found to be most abundant on the coasts of Mecklenburg, Slesvig and Holstein, anc in the bay of Lubeck.

Terrible Conflagration in Wisconsin and Minnesota.

As we go to press, we have telegraphic reports that a terrible conflagration is devastating some of the finest wooded regions of Wisconsin and Minnesota. Fifty townships have been burned out, including dwelling houses, barns, fences, telegraph lines, and every inflammable substance on the surface of the ground. Hundreds of families have been rendered homeless. Animals, wild and domestic, are running in every direction. The burned territory now presents an area of *three thousand square miles!* This is almost equal to the total area of the State of New Jersey.

TRUTH is immortal; the sword cannot pierce it, fire cannot consume it, prisons cannot incarcerate it, famine cannot starve it.

RECENT IMPORTANT PATENT DECISIONS BEFORE THE UNITED STATES CIRCUIT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA.---MC'KENNAN, JUDGE.

SAPONIFIER PATENT.

Pennsylvania Salt Manufacturing Company *vs.* E. A. Thomas; Pennsylvania Salt Manufacturing Company *vs.* Christian Barry. The complainant is the assignee of George Thompson, to whom reissued letters patent Nos. 2,570 and 2,571 were granted, for the unexpired term of fourteen years, from October 21, 1856. The first is for the process of putting up caustic alkali (soda or potassa) in metallic casing or integument, by pouring the molten caustic alkali into the casing, and then doing up the top: and the other is for caustic alkali inclosed in a light metallic integument or metallic casing. One is for the process of putting up caustic alkali, and the other for the product of such process.

The validity of these reissues is assailed upon the ground that they are not for the same invention described in the original patent. They are divisions of the original patent, and are, therefore, to be treated as but one patent, with two distinct claims. Although this division of the patent may have been unnecessary to effectuate the invention, it in no view impairs the validity of the reissues. Nor will discrepancy in the titles, and variations in the description and claims of the original reissued patent, avoid the latter. Their effect results only from diversity of subject matter. Battin *vs.* Taggart, 17 Howard, 84.

The material inquiry then is, is the subject matter of both patents the same invention? In other words, are the process and the product claimed in the reissue substantially described in the original?

In the original patent, the nature of the invention is stated to consist in "a new and useful mode of wrapping cakes of potash or caustic soda in air tight wrappings, so as to preserve it from the action of the atmosphere, being designed to enable the manufacturer, of the caustic alkali, to put them up in original packages of uniform size and weight, of such convenient size that when a package is opened the whole may be used at once." Two modes of carrying the invention into effect are described. One is to provide canisters of thin sheet iron, cemented at the joints with inflexible cement, into which the caustic alkali is poured in a molten state, and while hot, the lid is closely fastened down, so as to exclude the atmosphere. Now, while this patent describes and claims the process of putting up caustic alkali in air tight integuments, it describes also the object and result of the process. Packages of caustic alkali are produced of uniform weight, and such convenient size that when a package is opened the whole may be used at once. The very object of the description is to indicate a product possessing original merit as the result of an improved process.

In reissue No. 2,570, which is for "an improved process of putting up caustic alkali," the description of the process is manifestly in substantial accordance with the description in the original specification.

Reissue No. 2,571 is for an "an improvement in the manufacture of caustic alkali," and claims "caustic alkali, incased or enveloped in a tight metallic integument or casing, substantially as above described." The mode of incasing it, and its peculiar properties when incased, are distinctly described and stated, and with no material variation of phraseology from that employed in the original specification.

It is apparent that the subject of both specifications is caustic alkali, so put up and prepared as to secure special commercial properties, protection against deliquescence, capability of safe transportation, and adaptation to general use. The reissued patent, then, is for the same alleged invention described in the original specification, and the apparent object of the amendment was to make an explicit claim for it as a new article of manufacture and commerce, which was distinctly indicated as the patentee's invention, but was not technically claimed in the original specification.

It has been repeatedly adjudged that this may be done. "This," says Mr. Justice McLean, in Battin *vs.* Taggart, 17 How., 84, "the patentee had a right to do. He had a right to restrict or enlarge his claim, so as to give it validity and effectuate his invention." And so Mr. Justice Grier held in passing upon this patent, in this court, in Pennsylvania Salt Manufacturing Company *vs.* Guggenheim, 3 Fisher, 423.

The respondent further objects to the patent, that the invention claimed is not novel. I do not propose to notice in detail the evidence adduced on this point. It is sufficient to say of it generally, that it does not prove that the product, with distinguishing properties claimed by the patentee to belong to his, was in use before his invention. The hydrate of soda was a well known chemical substance, rapidly deliquescent when exposed to the air, and, by reason of its causticity, difficult to handle and dangerous to transport. An obvious security against these risks was to inclose it in anticorrosive, air tight vessels, and so it was treated, but in the modes adopted for its preservation it was only employed in the laboratory, in surgical operations, and in the arts, which would admit of the use of large quantities of it at one time.

It was not until George Thompson, after repeated experiments, perfected his method of putting it up, that caustic soda was brought into very general household use in the manufacture of soap. This was undoubtedly due to the plan devised by him for its preparation, whereby portability, safety and convenience in handling and transportation, and special adaptation to domestic use, were, for the first time, secured. The proofs, therefore, fall short of overcoming the presumption of novelty arising from the patent.

A grave objection is that which brings in question the patentability of the alleged invention. A patentable subject must be not only new and useful, but it must involve some exercise of the inventive faculty, and it must not be merely the application of an old thing to a new use. It is undoubtedly true, that small metal cans and infusible cement were in use before Thompson's invention, and that caustic alkalis were preserved from deliquescence by inclosure in air tight packages of glass, iron and wood; but still the fact remained that caustic soda was unavailable for general use, and especially for the domestic manufacture of soap. By Thompson's method it was invested with commercial properties and practical adaptabilities which did not pertain to it before.

Its deliquescent tendency and corrosiveness confined its consumption within narrow limits. By Thompson's efforts these difficulties were practically overcome, and it was fitted for general use and the supply of a universal want. In the language of Mr. Justice Livingston, in Langden *vs.* De Groot, 1 Paine, 206, "it was rendered more portable and convenient for use." The effect was to immensely increase its consumption in the domestic production of soap, which was before manufactured by other methods, or in large establishments only. Indeed, it may be considered as originating a new branch of domestic manufacture. This is certainly indicative of original merit, and is demonstrative of its great public utility.

The patentability of an alleged invention is, in many cases, most satisfactorily shown by its utility. In Webster on "Subject Matter," 30, it is said, "the utility, then, of the change, as ascertained by its consequences, is the real practical test of the sufficiency of an invention; and since the one cannot exist without the other, the existence of the one may be presumed in proof of the existence of the other. Wherever the utility is proved to exist in any great degree, a sufficiency of invention to support the patent must be presumed." Judged by the standard of utility, then, a sufficiency of invention to support this patent is to be presumed.

In a commercial sense it has just claims to be regarded as a new product. It was so treated by Commissioner Mason in the original application for a patent. In his opinion he very forcibly says: "Had he discovered an ingredient which, mixed with alkali, would, without injury to its properties in other respects, have prevented it from a tendency to deliquescence, he would have made a patentable discovery. Is not this equally so? In fact, the packages of alkali, done up as proposed, may, in substance, be deemed a new commodity, a new article of merchandise, for although its constituent ingredients are the same as were before known and used, a new property has, in reality, been communicated to it. In point of fact, the article now offered for sale is the alkali without any tendency to deliquescence; this, though chemically not new, is so commercially, and is so proved by the affidavits filed." Equally satisfactory proof of this has been exhibited in this case, and to this is to be added the wide extension of its use, as a significant recognition of its novelty as a commercial product.

The whole question was before this court in the Pennsylvania Salt Manufacturing Company *vs.* Gugg nheim, and the patent was held to be valid. Such a judgment, pronounced by a judge whose knowledge, experience and ability invest his opinion with the weight of high authority, must and ought to overbear all doubts upon the subject in this controversy.

That there are differences in the method employed by the complainant and respondents, to incase the soda and seal the packages, is doubtless true; but the product of both is substantially the same, namely, caustic soda encased or enveloped in a tight metallic integument, which may be preserved and transported, and thus introduced into general use.

The respondent, therefore, is an infringer.

Decrees were entered by the Court, referring the case to John Cadwalader, Jr., Esq., as Master to report damages Harding, for plaintiff; Cuyler and Burton, for defendant.

THE WETHERILL ZINC CASE.

In the United States Circuit Court for the District of New Jersey, Judge McKennan ordered a decree to be entered for the plaintiff, deciding Samuel Wetherill's patent to be valid, and that the New Jersey Zinc Company had infringed it, and referred it to S. D. Oliphant, Esq., of Princeton, as Master to estimate and report the savings and gains made by the defendants, and also awarded a perpetual injunction. Judge McKennan said he would file an opinion in full hereafter, but would now state the points of his decision, as follows:

In the Circuit Court of the United States, for the Third District of New Jersey:—Samuel Wetherill and George W. Gilbert, administrators of Charles J. Gilbert, deceased, and Martha M. Jones, administratrix of Samuel T. Jones, deceased. Also, S muel Wetherill and George W. Gilbert, administrators of Charles J. Gilbert, deceased. In equity.

1. The patent of Samuel Wetherill for a process of reducing ores of zinc, by the direct application of fuel to the ore in a crushed state.

2. The conspicuous merits of his process are: Great economy in the consumption of fuel; a more thorough liberation of the oxide from the ore than could be accomplished by any known treatment of it; the production of white oxide of zinc, of a better quality and at a less cost than it had been produced before; and the utilization of the slag resulting from the use of some of the ores of zinc. These results demonstrate its utility and value. Of its novelty there is no question.

3. Its essential features are in the employment of a thin bed fire of chestnut coal, and of a superincumbent layer of pulverized ore and pea coal, approximately of the thickness of three inches; the enforced passage of atmospheric air in numerous small jets through the mass, by which its combustion is maintained; the vaporization of the zinc and its oxidation in the furnace above the charge are effected, and the withdrawal of the charge when the zinc in the ore is expelled, and the repetition of the process.

4. It is fully, clearly, exactly, and particularly described in his specification.

5. It is satisfactorily shown, by the oral proofs and by the analysis of the slag, that the thinness of the bed coal and of the charge of crushed ore and coal, within the limit of eight or nine inches, and alternation of the process, are essential to its practical efficiency and success.

6. Burrows' patent is for a furnace, not for a process.

7. The directions given in his specification for the use of his invention, in the statement of its object, do not describe Wetherill's process in its essential features, or so that one skilled in the art could practice it.

8. He was not the first to conceive the practicability of reducing zinc ores by the direct application of fuel to them in a crushed state, and to demonstrate it by successful experiment.

9. Wetherill was the first to comprehend and perfect the process claimed by him, to describe it intelligently and fully, and to reduce it to practice.

10. The respondents are shown to have used his process substantially, and are infringers.

Decree for injunction and an account.

The case was argued by George Harding for plaintiff, and S. D. Cozzens, of New York, for defendants.

THE IRON SHIP A MAGNET.—The following are a few important facts, as deduced by Mr. Stebbing from his experience of iron ships: 1. A compass may be very true on one or several points, and greatly disturbed on others. 2. The errors of one ship are no guide to the errors of another. 3. The errors are least toward the middle of the vessel. 4. Every iron ship is a magnet in itself; some have the north pole aft, and some the south. The magnetic axis is frequently determined diagonally through the ship. 5. There are in all iron ships two points, either opposite, or nearly so, at which there is no error; there are two other points where the error is the greatest. An error will sometimes not alter three degrees in a range of five points, but may then change thirty degrees in the next five points.

TRUE liberty consists in the privilege of enjoying our own rights—not in the destruction of the rights of others.

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Improved Carpenter's Bench.

This is a very simple and practical improvement, which will add much to the convenience of carpenters. Our engraving of it shows so clearly the nature of the invention, that very little is left us to do in description.

At present carpenters' benches are provided with only one vise, attached to the side of the bench; or with two vises, one at the side and the other at the end. The invention of Mr. Starke enables one vise to perform the office of two, thus lessening the expense of such benches while adding to their usefulness.

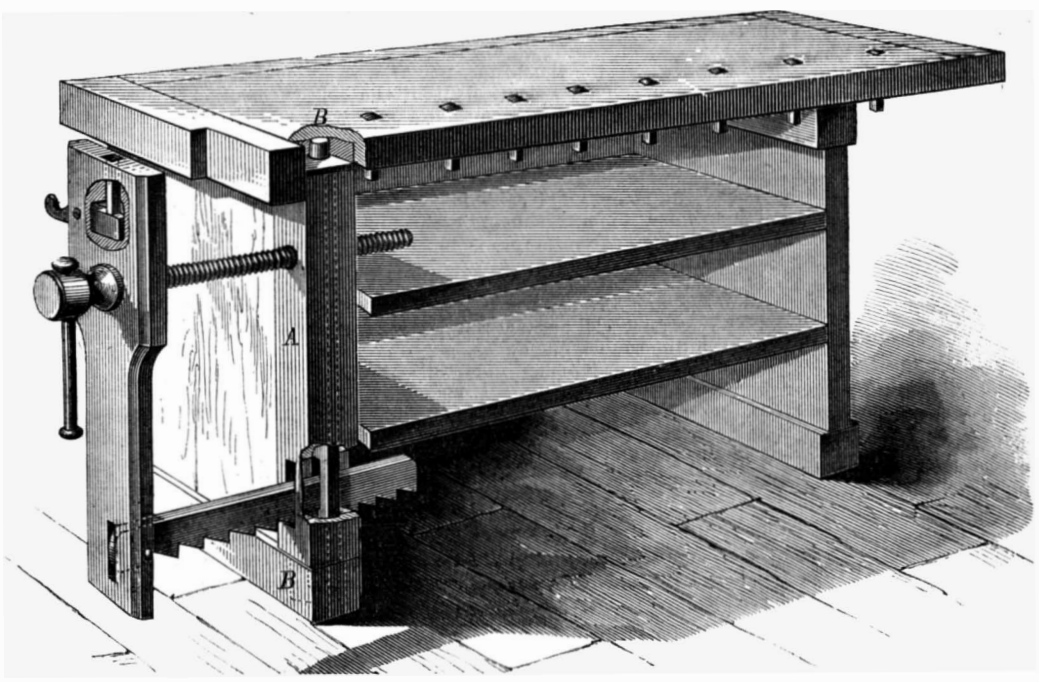
He accomplishes this by pivoting the port, A, which carries the nut of the vise, to the bench, as shown at B, so that the vise may be used either at the side or the end of the bench, as may be convenient for the work in hand.

The pivots are formed on the ends of a flat iron bar fitted into the body of the post, perforated for the reception of the nut, and slotted for the notched bar attached to the movable jaws of the vise.

The upper pivot or journal plays in a suitable bearing formed in a plate let into the under side of the table; and the lower one rests in a suitable step supported by a foot.

The advantages of this method of attaching vises to benches will be apparent to practical mechanics.

The improvement was patented through the Scientific American Patent Agency, Sept. 12, 1871, by Frederick Starke, whom address at No. 20, La Belle street, Dayton, Ohio.



STARKE'S CARPENTER'S BENCH.

Combined Safety Valve, Steam Governor, High Pressure Alarm, and Mercury Gage.

We may remark, by way of introduction to a full description of the construction of this apparatus, that the inventors hold that the method of marking the scales of steam mercury gages, by cold hydrostatic pressure, heretofore practiced, has led to error, from not taking into account the subsequent necessary expansion of the mercury column by heat. Without entering into the details of their method of graduating the scales of such gages, we will simply say that they obtain their column of hights from actual high pressure of steam, thereby approximating, as closely as may be, to the precise circumstances under which the gages must be placed in actual use. The scale is called geometrical because, in its marking, diagonal lines are drawn between vertical lines, showing geometrically the increase of pressure corresponding to different hights of the mercury column, expressed in inches and decimals of an inch. The pressures in pounds and atmospheres are also marked on the scale in vertical columns of figures, as are also the temperatures in degrees Fahrenheit, and hights of mercury in inches.

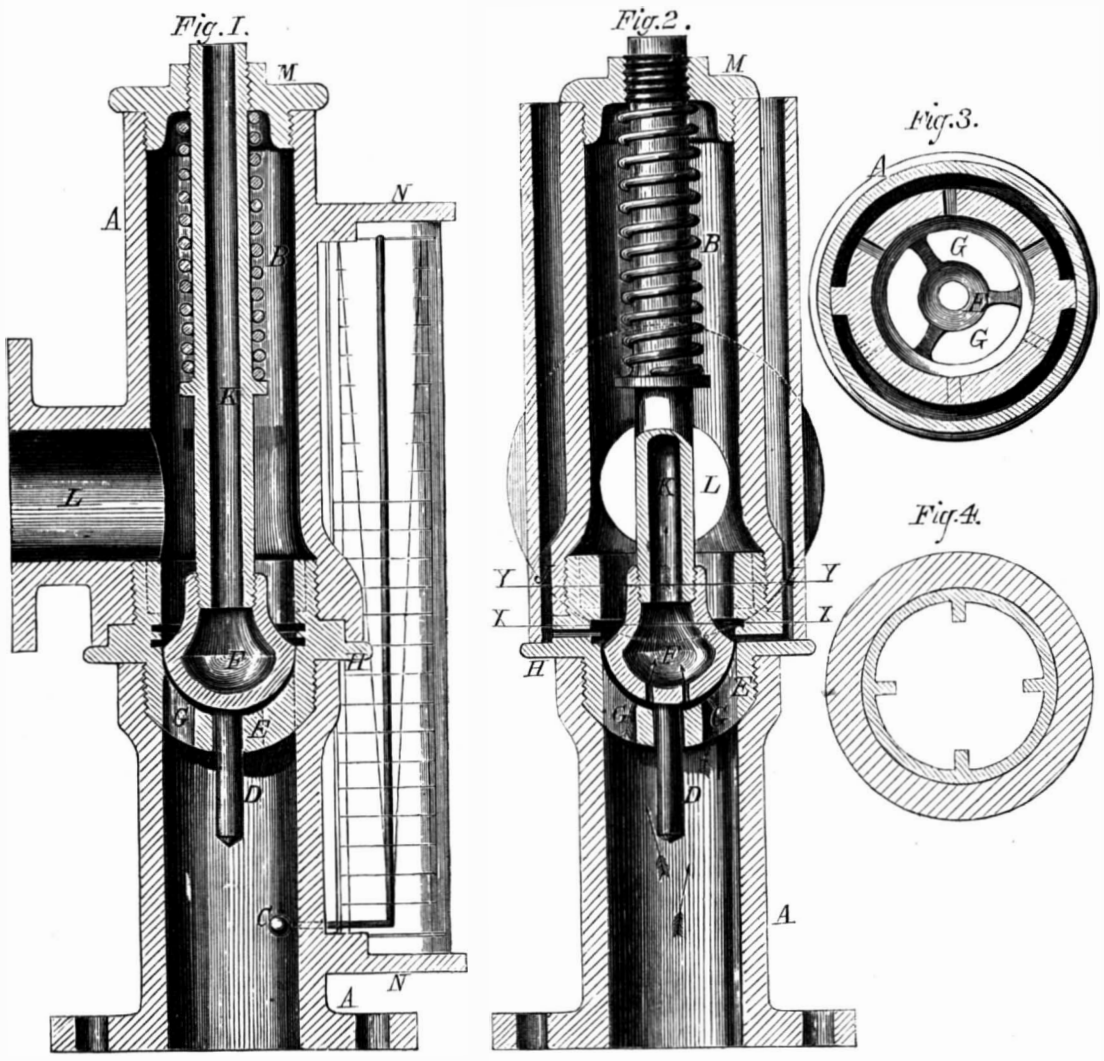
It is also held that the steelyard and weight can never act with the accuracy of a well tempered spring as a regulator of pressure upon a safety valve, where the spring is, as in this case, protected from the action of heat; and therefore the spring has been substituted for the steelyard, as indeed it has long been used on locomotives, and in some steam safety devices.

Combined with the gage there are three small pipes, opening to whistles or gongs, which give, respectively, indications that the pressure has reached that which the inspector has set the spring to carry, or five or ten pounds above that, according as one, two, or three of the signals are sounded. The first, or center pipe, described below, which will sound at a pressure somewhat below that at which the steam will blow off, gives warning to the engineer in charge and the fireman, that the latter is likely soon to raise too much steam, and thus prevents him from pushing the fire too far. As the other signals sound, should they be allowed to do so, they indicate nearer approaches to the pressure at which steam will escape from the safety valve, and thus, by warning the fireman to check the fire, prevent waste of fuel. Further increase of pressure raises the valve so as to allow the steam to blow off freely, all of which will become apparent on referring to the engraving, in which Fig. 1 is a sectional elevation, with scale attached; Fig. 2, a vertical section; Fig. 3, section through the line, X, and Fig. 4, a section through the line, Y.

The parts are as follows: A is a cast iron tube, with a cast top, screwed on or off by the inspector, and locked and sealed by him. The inside parts are of brass. B represents an annular space, in which the valve works freely, as described below, and without danger of locking, either by sticking in its seat or by the binding of the spring which governs the pressure. C is the mercury bulb, from which the tube extends laterally a little way, and then rises vertically along the middle of the scale, as shown. The tubes are made uniform throughout their caliber by drawing them over wire. D is a vertical guide attached to the valve. E represents the valve seat, made concave to correspond with the convex under surface of the valve, F, which is hemispherical in form, and is made hollow with small ports passing through it, by which, when it is slightly elevated, steam passes, the course of the latter being indicated, by the arrows, as passing through the ports, G, then through the ports in the valve or plunger, into the central pipe, K, to the alarm whistle or gong. H is the brass box for holding the thermometer and mercury gage; I is the side pipe which sounds an alarm, at a pressure, say of fifteen pounds under the blow off point fixed by the inspector. J is a side pipe, which sounds its alarm at, say ten pounds under the blowing off pressure. L is the waste pipe through which the steam passes when blowing off. M is the cast iron cap, which is screwed in over all and locked. N indicates the brass brackets for the attachment of the scale; and O the scale already described. The screw or steam governor, by which the tension of the spring is regulated, according to the age and estimated strength of the boiler, is not shown. The whistles, with the cap supporting them, are also not shown, the principles of the instrument being better indicated without them. The gage and scale are also covered with glass plate, bent into semi-cylindrical form, but not indicated in the engraving.

The whole forms a very compact and apparently reliable apparatus for the purpose intended.

For further information address S. B. B. Nowlan & Co., 202 Broadway, New York.



NOWLAN AND SPAULDING'S VERTICAL CUT-OFF STEAM SAFETY VALVE, STEAM GOVERNOR, FIRE SIGNAL AND GEOMETRICAL STEAM MERCURY GAGE.

Myers' Pneumatic Car.

A trial of this invention was recently made at Hyde Park, near Chicago, in the presence of about forty invited guests. The pneumatic car is, in fact, a locomotive engine driven by compressed air, contained in a large cylindrical tank mounted on four wheels, similar to those used on an ordinary horse car. The main tank is 7 feet in diameter and 16 feet long, made of boiler plate. Underneath this tank, and between the two axles, are a pair of ordinary cylinders and pistons, which drive an intermediate shaft that gears into a wheel on one of the axles. At each end of the car, or engine, and under the main tank, are two smaller reservoirs, 15 inches in diameter, both connected with the larger one. One of these smaller reservoirs has what is called a governor or regulator between it and the large tank. The cylinders draw their supply of compressed air, with which they are driven, from the smaller reservoir, and the object which it and the regulator are intended to accomplish is to keep the pressure, of the air supplied to the cylinders, uniform. In stopping the car or train, the valves are reversed, and the momentum is utilized to force air back again into the small tank. By this means not only is power economized, but the pressure in the tank which supplies the cylinders is increased above the ordinary working pressure, and is available in starting the car.

The other small tank to which we have referred has a check valve between it and the large tank. The object is to keep a small supply of air at the initial pressure, so that in case of emergency, such as getting off the track or other accident, there may be power enough to overcome the difficulty. The two small reservoirs are connected together with a pipe, having a cock or valve between them, so that the air contained in the one may be admitted into the other.

It will thus be seen that the arrangements and provisions for operating with compressed air have been made with much care, and the whole scheme looks quite promising.

The supply of air is of course compressed by a stationary engine and pump.

The advantages which are claimed for this system—which is especially intended for operating railroads on which horse power is now used—are that pneumatic power can be used on streets with less noise, without smoke and danger of explosions; that a pneumatic engine can be operated by a person with much less skill than is necessary in working a steam engine. There is of course, in compressing air, a loss of power due to friction, etc., but on the other hand it is claimed that one large stationary engine will work much more economically than many small locomotives. It is also thought that the waste due to the loss in compressing the air will be more than compensated for in the saving of wear and tear, repairs, etc., of locomotive boilers.

A public exhibition of the kind made recently affords but little opportunity for applying any severe tests, or of making any conclusive experiments; but although we went to it with some reluctance and with little expectation of finding anything of real value, we were obliged to revise our preconception and change our opinions. —*Railroad Gazette.*

S. R. BAILEY & Co., Bath, Maine, by their patent machine for sawing around a log, lately sawed a board four feet long and fifty-eight feet wide.

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HOMES FOR MECHANICS.

The tendency of modern times is towards the centralization of great manufacturing interests in large towns; and this naturally draws with it the class of population dependent upon mechanical labor for a subsistance. The great increase in the population of London, Paris, Berlin, and New York is an illustration in point. Unfortunately, factories and machine shops increase in proportions vastly greater than the accommodations for workmen. The former are built by men of large capital, while no one looks after the interest of the poor mechanic. Large sums are lavished upon improved machinery or architectural effects, but no one seems to think that anything need be done for the multitude of workmen the mills and factories necessarily bring with them. The natural consequence of all this is that the mechanic is badly housed, and falls a victim to the avarice of landlords, who take advantage of the neglect of the wealthy proprietors to provide homes for their men. The question has become a serious one in our large cities. In London it has lead to the introduction of early trains for the accommodation of laborers, thus enabling them to come to their work from a considerable distance out of town. Small houses, surrounded by a plot of ground large enough for a garden, and in the midst of green fields, have been built in great numbers in the suburbs of London, partly by charitable associations and partly by capitalists; and, in this way, the condition of a large number of people has been vastly improved. The example of Mr. George Peabody in London has been followed by capitalists until the benefits are felt by many thousands of people who were exposed to the worst features of the overcrowded city. By means of fast trains and suburban dwellings, the condition of the laboring poor has been greatly ameliorating; and as public attention is directed to the subject it is probable that other improvements will be made as fast as they are pointed out by experience. A somewhat similar agitation has taken place in Paris, but comparatively little progress has been made, as was conclusively shown during the recent Communist troubles. If the workmen had been in the suburbs, they would hardly have gone into a struggle that necessarily carried with it the destruction of their own homes, but, as they had no homes of their own to speak of, they took great delight in reducing wealthy people to their own destitute condition. The destruction of large numbers of houses in Paris by Baron Haussman, in furtherance of his scheme of beautifying the city, rendered many poor people houseless and occasioned an increase of rents to others. It was only by inventing some occupation for these people that they were kept quiet, and we have seen what became of them the moment this occupation was gone. The vast improvements in Paris have been almost exclusively conducted in the interest of wealthy people, and hence the question of what to do with the poor is one of the most urgent for the government to settle.

Between Berlin and New York there is great analogy. Both cities have grown with wonderful rapidity, and, in each, selfish speculation, in utter disregard of any higher consideration, has controlled the construction of new buildings. Wide streets have been laid out, and dwellings, with all the modern improvements, have been built on speculation; and the price of real estate has gone up more than a hundred per cent within a few years. In both cities, we also hear of showy manufactories and extensive warehouses; but the dwellings of the poor have been overlooked, and this class of population is huddled together in tenement houses and filthy streets. The remedy for this state of things in New York, as well as in Berlin or London, must be rapid transit. We must have some way of reaching the country in a few minutes. Instead of being confined to a small island, there is no reason in the world why we should not spread out over a radius of thirty miles. The interests of civilization, of good morals, of public security, of ultimate prosperity, demand that we should have rapid transit for the thousands of poor people who are drawn to the city by the requirements of labor and commerce.

At the rate we are now moving, we shall soon have a population made up of the very rich and the very poor; the middle class, the bone and sinew of the land, will be driven away, and the town will not be worth living in. While we are waiting for the construction of the much needed railroads, there is no question that it is the duty of employers to have some regard for the condition of their laborers; and, by a personal inquiry and inspection of their homes, they have it in their power to protect them in many ways. It may be found worth while to spend less money in showy manufactories, and to put the savings into suitable dwellings for mechanics. This plan is found to work well in the country. It is becoming more common than formerly for manufacturing companies in the country to lay out handsome grounds around their mills, and to build neat cottages for their workmen, which can be purchased, if the men choose, and paid for out of the savings of their wages. There are not a few such establishments scattered over New England, and if the mechanics living in tenement houses in New York could see how vastly more comfortable their brethren in the country are, they would hardly expose their families to the miseries and temptations of the city, but would flee at once to the green fields and healthy air of the country. The families of mechanics in the country are on an equal footing with their neighbors. The children meet on common ground; and, in the public school, merit and not artificial rank makes the aristocracy. We were recently present at a school examination in the country, and were gratified to see two children of poor mechanics carry off the prizes. The probabilities are, in the refined society of the country, that they will continue to win prizes until they become prominent citizens, and then they may safely go to town. Whether in the city or the country, there is no class of our citizens better entitled to comfortable homes than mechanics; and it is certainly in the interest of capitalists to see that they are amply provided.

THE ENGLISH PATENT SYSTEM.---WHAT WILL THEY DO WITH IT?

The British mind is tortured by the effort to solve two very grave problems. For a long time the entire inventive talent of that favored land has struggled to devise some means whereby passengers on railway trains—inclosed as we shut up puppies in crates for shipment—can communicate with the guards. Most complicated and ingenious methods have been proposed; but, alas! none have been without some fatal objection. The powers of air, earth, and water all fail in the hands of Englishmen, to transmit intelligence on a railway train. The bell cord which we uncivilized Yankees have found so simple and convenient, is so obnoxious to mischievous puerile Britons that this resort has been abandoned as hopeless, and so the Englishman may still be born, may die a natural death, be robbed or murdered between stations, cut-off from all intercourse with the external world. What will eventually be done with this problem, is a question that recurs as often as a fight or a robbery occurs in a railway riage, or some woman gets frightened nearly to death by finding herself locked in with an insane person. But the appeal is made in vain. Plenty of suggestions follow, but nothing practical is forthcoming.

Another problem now engages the political economists of the realm upon which the sun never sets, and excites the interest of the engineering public, "What shall we do with our English patent system?" is the current question of the time, discussed at dinner parties, on street corners, in alehouses, at fairs, and we had almost said at funerals.

Mr. Macfie (we wonder if the last syllable of his name is pronounced like the interjection of same orthography) thunders whenever he can get a hearing, "Let us abolish it! Let us abolish it!" Mr. Ruskin, who has gained a literary reputation akin to that of Charles Reade, by expressing some weak ideas in a very forcible manner, gets off a string of poetical nonsense which does not much affect the main question in any way. The London patent agents jump to the other extreme, and declare, by resolution in public meetings that men have an exclusive natural right to hold and use their inventions *in perpetuo*. Mr. Nasmyth and Mr. Bessemer have talked common sense, and insist upon the limited patent system as answering the purpose for which such privileges are granted; namely, the securing public benefits by rewards to individuals conferring them. Sir William Armstrong has been obstructed in developing ideas by patents that have stood in his way, and henceforth he is an enemy of patents. M. Schneider thinks that if A does not invent an improvement today, B will do it to-morrow, and hence B's right to the invention is as good as A's.

The Select Committee of the House of Commons, before whom all these opinions have been aired, must have had impressed upon their minds the serious character of a question admitting of so many conflicting views. What will they do with it? In all probability they will do as has been done with the railway communication puzzle, leave the patent laws as they are, although the disposition of many seems to be to adopt our system of examination.

THE GOLD WEIGHT OF SUNSHINE.

Some years ago Professor John C. Draper published a description of an actinometer, in which the chemical power of the sun's rays was measured by the precipitation of gold. Though of great value to the agricultural interest of the country, such determinations have not yet been attempted to any extent; we therefore give a brief account of the process, in the hope that some of the gentlemen interested in our numerous agricultural institutions may be induced to devote their attention to a subject which, if properly developed, may enable us to make an estimate of the probable value of the crops of a locality, by determining the amount of actinic rays to which they have been exposed.

Draper's process is founded upon the fact that a solution of peroxalate of iron that has been exposed to sunlight throws down a precipitate of gold from the solution of chloride of gold, while the freshly prepared peroxalate that has been made in the dark has no such action.

The success of the operation depends on the freshness of the peroxalate, and the uniformity in the method of preparation and manner of exposing the solution to the action of the light. To ensure the first and second of these conditions, the solution was prepared every evening by dissolving moist pure peroxide of iron in a standard solution of oxalic acid, and raising the temperature to the boiling point. The excess of peroxide of iron was then separated by filtration, and the solution placed in the tube in which it was to be exposed to the light on the day following.

Uniformity of exposure was obtained by placing the tube in a small box, blackened in the interior, and with an opening one inch square on one side. The opening was turned toward the polar star, and the contents of the tube thus exposed to a diffuse daylight under conditions that could be rigorously reproduced each day.

In the evening, the contents of the tube were treated with a carefully prepared pure solution of chloride of gold, and the precipitate collected on a filter, dried, ignited, and weighed when the weight of precipitated gold indicated the amount of change the sunlight had produced in the solution of peroxalate of iron. To save time, the solution of peroxalate to be used the day following was prepared in the intervals that occurred during the performance of the last described operation.

HOW MANY HOURS OUGHT TO CONSTITUTE A DAY'S WORK?

This question has been temporarily answered by the Trades' Unions. We say temporarily, because the public has no guarantee that if the eight hour system be generally conceded by employers, further reduction will not ultimately be demanded. And it cannot be denied that if every adult and youth of sufficient years were an actual producer of something useful or pleasureable to mankind, the present average standard of comfortable living might be maintained with much less than eight hours' labor per day from each person.

The supposition that each healthy individual, old enough to work, should employ himself or herself in actual production, involves a total reconstruction of society, the extirpation of drones from the hive of humanity, in short, a revolution of such magnitude that it is well nigh hopeless, at least for centuries to come, and will probably never be reached without fierce conflicts between vested interests and those who would subvert them.

For the present, therefore, the daily labor must obey the commercial laws which regulate the prices of everything bought and sold in general market, as both mental and physical labor now is.

There is, however, an unreasonable extent to which men in exceptional cases are made to labor, which, although in accordance with the law of supply and demand (else the consent to excessive work would not be obtained) is still, because exceptional and excessive, a fit subject for reform, and, if need be, for that wholesome legislation by which extortion in commercial transactions is controlled.

Two most prominent instances of excessive labor are to be found in the English steam railway service, and in the American street tramway or horse railway service. In both these instances, the labor demanded is of the most exacting nature; so much so, indeed, that it is difficult to conceive how men can be secured at the prices paid for the performance of such work. That men have by misfortune, or by bad habits, so exhausted their resources that they are glad to get even such employment, is not a moral justification of the greed that willingly fattens upon the misfortunes of others.

One Mr. M. T. Bass has philanthropically spent much time and labor in investigating the general condition of the employés under the railway management in England, and some facts thus brought to light are published in the issue of *Engineering* for Sept. 1st. A mere glance at these statements will suffice for our present purpose.

"Engine drivers," as they are called in England, ("engineers," as we call them in America,) are sometimes called upon to perform 28 hours of continuous labor, while guards often perform duty from 18 to 40 hours without rest. On some occasions these overworked servants do not remove their clothing from one week's end to another. Signal men are commonly employed for 12 consecutive hours, during which they have, at busy stations, no time to take food. In addition to this, they are compelled once a fortnight to work a night shift, in which their labor is prolonged to 18 or 19 hours.

Such are a few facts. Is it any wonder that such overworked eyes, hands, and intelligences sometimes err in the performance of duty, and that shocking accidents occur as the result of their neglect?

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On American steam railways. the hours of labor required are not so protracted; but on our horse railways the conductors and drivers are shamefully overworked. Sixteen hours a day, with meals eaten upon the car, and with scarcely a moment to sit down in all that time, except for perhaps four or five minutes at the end of trips, is not an uncommon thing on these roads; and this is for seven days in the week. Such are the demands made, upon the men in their employ, by the horse railway companies in New York.

It is common to find among these men, varicose veins, swelled feet and limbs, ulcers, etc., caused by protracted standing. Their case is truly a hard one, and is rendered the more trying from the impatience and often injustice of the travelling public. Many men seemingly take delight in abusing a man who has no redress against abuse except what will risk his situation, and a situation must be worth something to a man who is willing to perform such service.

These abuses are perhaps not generally known to the public; if they are, they are looked upon with an equanimity astonishing in a proverbially sympathetic people. Such a life, as these conductors and drivers lead, is no better than abject slavery; but what shall be done about it? Clearly, when men not only accept such labor, but are glad to get it, there is something to justify the complaints made by the working classes of the unequal distribution of labor and its rewards.

It is true that these men cling to commercial centers, rather than accept unknown, though really easier vocations, in agricultural districts. Without skill in any particular occupation, they have drifted into their present one, and dread to leave it, as apprehensive of a worse.

The ignorant and weak always become a prey to intelligent rapacity; and as there is no help for this except in special legislation, it is to be hoped that the moral sense of the community will place a check upon the avarice of the corporations who extort such labor, and thus better the condition of their employés, by either securing them equal pay for fewer hours' work, or, by reducing their wages, compelling them to seek other and better fields of employment, which they now seem afraid to enter.

THE VALUE OF PROPERTY IN PATENTS ILLUSTRATED. RECENT IMPORTANT PATENT DECISIONS.

We publish in another column the decisions of Judge McKennan, of the United States District Court, in the great suit of Wetherill *et al versus* the New Jersey Zinc Company, and the suit of the Pennsylvania Salt Manufacturing Company *versus* Thomas and *versus* Barry for infringement. In both instances the patents were sustained, and the judge, in making his decisions, gives some interesting views in reference to what constitutes patentability in inventions.

One of these decisions seriously affects the prosperity of the large and money making corporation known as the New Jersey Zinc Company. This concern has for several years enjoyed a highly lucrative business in the manufacture of zinc white. But the present decision will perhaps sweep the company out of existence. We understand that the damages for infringement, which the Master must necessarily report in favor of the plaintiffs, cannot be less than one million eight hundred thousand dollars, which represents the actual net profits accruing to the Company within a few years from the use of the Wetherill patent.

The stock of the company at once declined nearly to nought, in New York, when the foregoing decision was made known.

This case is but one of many instances that illustrate the great value of property in patents. The courts in all cases construe them liberally, and as far as possible, aid the patentee in obtaining what the patent laws were expressly designed to give him, namely, encouragement and reward for discovering and promulgating new inventions.

FAIR OF THE AMERICAN INSTITUTE.

We have received a letter from one of the managers of this exhibition, denying the statement, made in a recent issue of this journal, relating to want of a suitable entrance upon Second Avenue, and claiming that sewers are being constructed on the north, east, and south sides of the building, which would render such an entrance unserviceable, if provided. The facts are that the sewer in Second Avenue was completed for some distance past the Rink, before the opening of the Fair; and that there is no entrance suitable for ladies on that side of the building. The statements made in regard to the opposition to construction of such an entrance, on the part of a manager largely interested in the Third Avenue railway, were made on the authority of one of the members of the American Institute, who claimed to be personally cognizant of the facts in the case, having, as he said, himself brought the matter before the managers, and been met with the opposition alleged.

The attendance this year is said to have been better than at any previous exhibition. We are glad this is so. There is no reason why these displays should not prove profitable, both to the Institute and the public; but in order that they should reach their full measure of usefulness, the managers must not disregard wholesome criticisms of the press, made in no carping spirit, but solely with a view to aid in bringing these up to a standard which will not suffer in comparison with that of any other industrial exhibition.

EARTH CLOSETS.

The progress of the earth closet system is indicated by the fact that no less than five different manufacturers exhibit earth closets this season. Of these, four show patented articles of elegant styles, and evidently very efficient design. Each exhibits quite a variety of finish, and the collection forms an interesting feature of the exhibition.

A collection of ornamental

BRASS AND COPPER WORK,

shown by Harell & Hayes, Paterson, N. J., elicits high praise, for the artistic design and beauty of finish of the articles exhibited, which comprise a great variety of sheet brass and copper ornaments for locomotives, steam fire engines, etc. They are perhaps as fine specimens of brass spinning as have ever been exhibited.

ATLANTIC CABLE OF 1856.

The only remaining piece of this cable is placed on exhibition by the Stevens' Institute of Technology, at Hoboken, N. J. It is an interesting relic of a remarkable event in the history of the world, and its value will increase with the progress of time. We judge there are about 150 feet of the cable on the reel. The contributions of the Stevens Institute have added much to the interest of the fair. Among them is to be seen a

PRIMITIVE STEAM ENGINE,

with tubular boiler, constructed by Mr. Stevens, the founder of the Stevens' Institute, and used, in competition with Fulton, on the Hudson and Connecticut rivers. The propulsion was obtained by twin screws. It is a queer looking affair, and might be loaded entire on a common dray, and drawn away with ease by a single team of horses.

Close by this relic stands Hall's Machine for Refitting Valves, recently illustrated and described at length in this journal. It attracts much favorable comment. It is shown by C. F. Hall & Son, 21 Murray street, New York.

In this part of the building also stands a

RED GRANITE SHAFT,

taken from a quarry, situated on the bay, at the mouth of Chandler's River, in Jonesborough, Maine, on a good harbor, accessible by vessels of all sizes. The quarry contains about two hundred acres. Its highest elevation is about one hundred and fifty feet above the level of the sea. The shaft is beautifully polished, and is very handsome. As an ornamental building material, or for ornamental architecture, it is unsurpassed by anything yet discovered in this country. It is exhibited by S. V. French, 176 Fulton street, New York.

In the line of

SEWING MACHINES,

all the leading manufacturers are well represented. We notice a new machine, exhibited, we believe, by the Carpenter Sewing Machine Needle Company, 95 & 97 Liberty street, New York, which has a very unique and ingenious drop wheel feed. It is the invention of Miss Carpenter, the inventor of the self threading needle, described and illustrated in these columns some time ago.

We also notice a very highly finished and apparently very efficient sewing machine for stitching on boot soles, shown by the Goodyear Boot and Shoe Sewing Machine Company, 194 Broadway New York. Specimens of the work done by this machine are very fine indeed. It has not been our good fortune yet to see the machine in operation; but, as a specimen of ingenious mechanism, it will repay minute examination.

In the extreme rear of the building are placed two improved rock drilling machines, of different styles, designed for different kinds of work. The machines are of the kind known as diamond drills, and are shown drilling various kinds of stone, from very hard to very soft rock. The machines are shown by the American Diamond Drill Co., 61 Liberty street, New York, and as they will shortly form the subject of an illustrated description in the SCIENTIFIC AMERICAN, we will defer a discussion of the details of construction till that article appears. The machines drill hard rock with great rapidity, and attract a crowd of admiring visitors whenever they are at work.

At the front end of the building, Mr. William A. Walker, looking glass silverer, 28 Prince street, New York, exhibits a number of large vertically and horizontally bent mirrors, which give such disturbed images of persons approaching them from various directions as to keep an amused crowd in constant spasms of fun. A person approaching one of these mirrors sees himself elongated and attenuated to the highest pitch of physical emaciation, and steps from it before another to discover that he has suddenly grown into Falstaffian proportions. Some curious optical effects highten the fun of the thing, and it is really pleasant to witness the delight of the children in this comical corner. We presume this is the man who furnished the wag of a landlord out West with a mirror, at the entrance of his dining room, which made his guest look very thin and elongated as he entered for his meals, and he, to his astonishment on coming out, beheld himself in a mirror at the opposite side of the room with proportions so large he wondered how he got through the door.

Of greater interest and importance, though not so amusing, are the specimens of

SAND ENGRAVING

on glass shown by the same exhibitor. This curious process has already formed the subject of several articles in the SCIENTIFIC AMERICAN, so that we only need repeat here that the engraving is accomplished by showering the glass with sharp sand, the sand being driven by steam or compressed air jets, the parts which it is desired not to cut being protected from the sand by paper patterns, lace, stencil plates, etc. A very good general effect in ornamentation is very cheaply obtained in this way, the engraved portions resembling etchings quite closely.

CHEMISTRY.

If any one were to take the present exhibition of the Institute as affording a good representation of the applications of chemistry to the arts, he would go away with a very erroneous impression of the importance of this branch of knowledge. Chemistry is, in fact, more conspicuous by its absence this year than it is by its presence. Still, there are a few good things, and of these it may be well to speak. The number of processes and trades in which chemistry plays a part unknown to the popular mind is always great in any exhibition of works of industry, and the Fair of the Institute this year affords no exception. Of some of these we can speak further on.

A PATENT PERFUMER.

A good many years ago, Professor Daebereiner discovered a property of spongy platinum to glow when exposed to a current of hydrogen gas, until it became so hot as to ignite the gas. Somewhat later it was found that a brilliant red hot surface of platinum would accomplish the same purpose; finally, a heated coil of platinum wire, suspended over ether, was found to continue to glow as long as any vapor was given off, and if the same coil were hung over boiling ammonia, into which was passed a current of oxygen, the hydrogen of the ammonia was made to unite with the oxygen with an explosive force. Numerous practical applications have been made of these discoveries, and one of the neatest is exhibited by Mr. Otto Boldemann, of No. 148 West 14th street, New York, under the name of the Magic Perfumer and Deodorizer. Proof spirit, scented by some essential oil, is put into a cup covered with mica or glass, and a thin piece of platinum, cut into various fancy patterns, after having first been made red hot, is suspended over the liquid. Immediately the vapors of the alcohol begin to rise, and, as they impinge on the metal, are partially decomposed, thus keeping the foil red hot, presenting in the dark a beautiful glow of fire without any perceptible cause. It is a pretty philosophical toy such as every teacher would like to possess; and certainly accomplishes its object of disseminating perfume in a very economical way. It is a pleasure to see a well known experiment of the class room brought down to supply the wants of every day life, and we hope that the Magic Perfumer will receive due attention.

STEEL DIRECT FROM IRON.

Steel is generally made from iron, so that the label in this instance affords but little information. It is probable that iron is immersed in cyanide of potassium, and that the decomposed cyanogen imparts the property which is possessed by steel. The process was tried in a modified form, for casting steel cannon at the time of our war, and it has been applied to the conversion, of sheet iron, scrap iron and certain tools into steel. It is not intended as a substitute for the Bessemer invention, nor for the cementation process so long in vogue, but has its value for small articles.

It is always well to have a short explanatory label attached to an exhibition of an article of this kind, so as to enable persons to acquire some information; and if the visitor is in that line of business, he is pr tty sure to want to know more, and will naturally apply to the inventor.

EXTRACTION OF TIN FROM CLIPPINGS.

This is one of the most important processes on exhibition, and, if it successfully accomplishes its object, may be set down as having solved a problem that has occupied the attention of chemists and metallurgists for many years. A good many patents have been taken out for utilizing tin scraps, some of which have successfully accomplished the object for the particular locality where the works were erected. It may be well to speak of a few of these, before proceeding to describe the method now on exhibition.

Stannate of soda, a valuable article in dyeing, is prepared by rolling the scraps into spirals, and subjecting them in wooden tanks to the action of sulphur and caustic soda. From one hundred pounds of scraps, twelve to fifteen pounds of the stannate are obtained, worth 18 to 20 cents a poound. The iron is economized in the preparation of a polishing powder for glass, or in the manufacture of steel, or for other purposes.

Another process employed in New York was to subject the scraps to a high heat in circular iron baskets, and thus to melt off the tin, and allow it to run into suitable receptacles.

Still another was to dissolve off the tin, and afterwards recover it from the solution. And the scraps have been used in the smelting of phosphorus ores, especially phosphate of lead. An English chemist separated the tin from the iron by means of soda, lye, and litharge; also, by employing a mixture of caustic alkali and chromate of potash. Nitric and muriatic acid, also the amalgamation processes, have been patented; and sulphuret of calcium has been substituted for the same compound of sodium. Instead of amalgamation, the fusion of the tin by throwing the scraps into a melted bath of lead, and thus producing a solder, has been tried. These are not all of the patented processes, but must suffice for present purposes. They have some of them been described in former numbers of the SCIENTIFIC AMERICAN.

In the new plan, proposed by Dr. Ott, the tin is dissolved off the iron by muriatic acid, and is afterwards precipitated by means of zinc. Some nitric acid is added to facilitate operations. Any zinc that may fall into the vat is removed by mechanical means, and the pure tin is afterwards melted into ingots or sheets ready for use.

A full and interesting account of the process is given by Mr. A. Harnickel, in the *Iron Age*. According to this article, the importation of tin plate into the United States amounts to 700,000 boxes per annum. The waste from this is set down at 25 to 30 per cent, and the writer estimates that within radius of 70 miles from New York "30 tuns of clippings can be procured daily, equal to 9,000 tuns per working year of 300 days. The saving of such an enormous loss as this may well attract the attention of capitalists, and it is to be hoped that the new invention may prove successful.

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SELF FEEDING BATTERY.

A good many persons have tried this, but with doubtful success. The apparatus on exhibition, called the "Himmer battery," employs sulphate of copper, by putting it into an inverted bottle, so arranged as to be self feeding. It would be difficult to regulate the quantity in this way, and that is an objection to the contrivance. We have read of a recent German battery where this difficulty has been overcome.

HORSFORD'S BREAD POWDERS.

This is a first class chemical discovery, and we were glad to see so many persons acquiring information how to use the phosphates instead of the saleratus powders, which are the bane of American kitchens. No family that has ever used Professor Horsford's baking powders would be willing to go without them. There are few things more useful than the phosphates, and nothing, short of poison, more dangerous than saleratus.

THE ZINC WHITE PATENT DECISION.

The recent decision in the United States Court, referred to elsewhere, and for which we are indebted to the Philadelphia *Inquirer*, is a matter of great interest to all owners of and applicants for patents. Though directly aimed at the New Jersey Zinc Company, it pecuniarily concerns all the manufacturers of zinc oxide in this country, as it is only in the United States that this pigment is made direct from the ores. The Lehigh Company, however, have some arrangement with the patentee. This industry is now becoming one of great importance, and it is well that the modes and process of carrying it on should be upon a firm basis, and that those to whom the credit is due for its origin should receive their just reward. It is one of those many instances constantly occurring which show the importance of having the application for a patent properly prepared, so that, however infringed upon by wealth or power, justice will in the end be done to the right inventor.

The damages involved are said to amount to about $1,800,000, as Wetherill claims that the difference between making zinc oxide by his process and the pretended process of Burrows is two cents per pound. The product of the New Jersey Zinc Company has been often as high as 5,000 tuns per year; hence if there be such difference, the "savings and gains" on that amount must evidently be very large. Injunctions have been served on all the other zinc making companies. From the length of time this case has been before Judge McKennan, the care in collecting evidence by both parties, the great wealth and influence of the defendants, it is probable that the decision is given only upon the most mature thought and thorough examination of the whole matter, and will be sustained, even should it be carried to the Supreme Court.

English Telegraph Message Blank.---Postal Card.

The *Home Journal*, in a recent number, described the message blank of the British postal telegraph system. A copy of the form lies before us. It is so arranged that the message appears in lines of five words each, the charge for the message being printed at the ends of each line. It is a simple and convenient device, calculated to save the time of both the sender and operator, and prevents overcharge. We are indebted to Mr. Morris Phillips, of the *Home Journal*, for this specimen, and also for a specimen of a postal card so much in use in England at the present time. The card is about three by five inches in size, and tinted with a tasteful color, one side having a halfpenny postage stamp imprinted on the right hand upper corner, the whole surrounded with a neat border, and bearing the British coat of arms. This side is for the address, and the reverse side is for the written message or note. No envelope is used, the card serving as note sheet, envelope, and postal stamp, and is delivered anywhere within the United Kingdom of Great Britain, Ireland, and the Channel Islands for half a penny—one cent. The report of the first six months' sale has just appeared, which shows that 58,485,960 cards were sold in that time by the government; total value, nearly £122,000.

TO MAKE CARBOLIC ACID PAPER.—Carbolic acid paper, which is now much used for packing fresh meats, for the purpose of preserving them against spoiling, is made by melting five parts of stearine at a gentle heat, and then stirring in thoroughly two parts of carbolic acid; after which five parts of melted paraffin are to be added The whole is to be well stirred together until it cools; after which it is melted and applied with a brush to the paper, in quires, in the same way as in preparing the waxed paper so much used in Europe for wrapping various articles.

THE ALABAMA AGRICULTURAL AND MECHANICAL ASSOCIATION announces its annual fair, to be held in Pickett Springs Park, Montgomery, on October 31st, and four following days. A list of premiums, amounting in all to $20,000, is offered for successful operation in all branches of agriculture and mechanical trades, as well as of domestic industry and the fine arts. Mr. M. L. Woods is the secretary of the association; and our readers will find detailed information in our advertising columns.

A COTEMPORARY has the following rather severe hit on the San Francisco Academy of Science: "The bone work of a whale recently stranded on the beach at San Francisco, is being wired together for exhibition. The owners secured the services of the Academy of Science to get the bones into their proper places, but at the end of the first day the members were paid off and discharged. It has since transpired that they got the creature's head on the wrong end, and had rejected several sections of the backbone, claiming that the animal had more vertebræ than the books allowed him.

SHARP WORK.—A merchant in Manchester, England, recently wanted 1,500 pieces of printed calico, of a particular pattern, for shipment to America. At 5 o'clock one evening he went to Harpeney, three miles from Manchester, to see a cotton printer, who undertook to print the 1,500 pieces in three colors, and to have them packed in cases ready for shipment by noon on the following day. This was done, and at 3 o'clock the goods were at Liverpool, and at 5 o'clock they were on board a steamer, going down the Mersey on her way to New York.

THE splitting machine, for shoe pegs, which are now manufactured so extensively in this country, and exported to Europe, was invented thirty years ago by S. K. Baldwin, of Laconia, N. H. A pointing machine for the manufacture of the same article was invented twenty years ago by A. H. Baldwin, of the same place. It is said that neither of the Baldwin machines have been improved upon since they were first introduced to the public.

Examples for the Ladies.

Mrs. J. S. Bingley, Poughkeepsie, N.Y., has used her Wheeler & Wilson Machine over 15 years; brought up and educated her family by stitching. shirt-bosoms, the bindings on to leathern cap-fronts, and making coats, vests. pantaloons, and doing all kinds of family sewing; averaging sometimes $5 and $6 per day.

The Human Hair.—Burnett's Cocoaine, for healthful purity and excellence, is unsurpassed.

Queries.

[*We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.*]

1.—HEATING SURFACE OF BOILERS.—Will some one give us, through your paper, a simple rule for finding the heating surface on tubular and locomotive boilers?—C. and H. A.

2.—PENCIL LEAD.—Will some of your readers please inform me how pencil lead is prepared, and what the ingredients are?—H. J.

3.—SKELETON LEAVES.—How can the tissues of leaves be removed without injuring the skeletons?—J. V. M.

4.—SOLDERING FOR GALVANIZED IRON.—Do any of your readers know a good solder for soldering galvanized iron, that will not break easily like the ordinary tinman's solder, that is, half tin and half lead?—A. B.

5.—CRYSTALLIZATION OF STEEL.—Do you think that the steel in band saws has a tendency to crystallize on account of the change from a curved to a straight line that takes place in running around pulleys?—J. L. G.

6.—BLUING PISTOL BARRELS.—Will some one be so kind as to inform me of the process or composition to give pistol barrels that beautiful blue that they give in the factories to new ones?—M. M.

7.—COKE FROM BITUMINOUS COAL.—I wish to know if there is a successful way of burning bituminous slack coal into coke in the open air on the ground?—A. M. S.

8.—UNDERGROUND SURVEY.—How can I survey an underground level or horizontal entry where there is an iron track, without the needle being affected by the track?—A. M. S.

9.—PRIME COAT OF PAINT FOR WOOD WORK.—In repainting an old house (outside), should I first apply a good coating of petroleum or other cheap oil to be absorbed by the boards? Would such an application save paint, or make the paint less liable to crack or peel off? If so, what sort of oil would be preferable? Would a like application to a new picket fence make it more durable, or would it make paint hold better on it? Is coal tar, as a preservative of fence posts, applied hot to the end that goes in the ground?—L. G.

10.—FRENCH POLISH.—Will some one please inform me how to make French polish for polishing veneered work?—W. B. W.

11.—CLOTHES WRINGER.—How can I keep a common clothes wringer (I mean the rollers) from cracking?—W. D. F.

12.—MANUFACTURE OF ZINC PAINT.—I have on hand a tun of sulphuret of zinc which I wish to convert into paint. Can any one inform me of the best mode of doing it?—E. M.

13.—GLUE.—Will some one inform me of the manufacture of glue—how it is boiled, how it is tested, and the stock used for the different grades? I want a good practical answer.—T. C.

14.—BLEACHING.—I wish to know the manner of using antichlorine—hyposulphate of soda—as a means of destroying the chlorine left in cotton and linen goods after bleaching.—J. W. G.

15.—COMPOSITION FOR TEMPERING STEEL.—I wish to inquire if there is anything in use that is better than water or oil for tempering cast steel. If any reader knows of such a composition, I would like to be informed of it.—J. T. B.

16.—LIQUID GLUE.—In the SCIENTIFIC AMERICAN, Vol. XXIV., page 408, "Answers to Correspondents," under the heading "Liquid Glues," F. L. J., of Ark., says that the best liquid glue he knows of is made as follows: Take of gum shellac three parts, caoutchouc (india rubber), one part (by weight), dissolve the caoutchouc and shellac in separate vessels, in ether free from alcohol, applying a gentle heat; when thoroughly dissolved, mix the two solutions, and keep in a bottle tightly stopped. Now I have been trying for two months to do as he says, but after dissolving the caoutchouc and shellac in separate vessels, when I put them together, the compound immediately forms into a solid ball, and remains so. Will F. L. J. please inform me what is wrong, as I have consulted a very good chemist without being able to learn?—H. W. M.

17.—CLEANING BRASS.—I want to know if there is not something that can be used to clean and polish brass work, on steam engines etc., that does not require so much elbow grease. The following is the *modus operandi* I go through to have the desired effect: I first spread thinly over the hot brass what is known among railroad men as sperm (large thick candles that are used to light coaches). I then saturate a rag or piece of waste with coal oil, and wash off the sperm and wipe dry. I then take another piece of waste and saturate with lard oil, then sprinkle on flour of emery or rotten stone, and scour all the brass, hot and cold, with this. I then wipe all nice and dry, and polish with lamp black or rotten stone. I feel satisfied that there are other preparations for cleaning brass than these that will do it quicker and better. I once saw a preparation sold on the streets of Cincinnati for cleaning brass and silver ware. It was a red looking stuff like brick dust; it would make brass look as white as silver. There is also a preparation for putting on brass to keep it from tarnishing, called "lacker" I believe. I do not care so much for this as I do for the cleaning process. I will be many times obliged to any of your readers who can furnish the desired information. I will pay a reasonable price for any recipe that will do the work satisfactorily.—G. N. K.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The Oil used on all the Machinery at the A. I. Fair is from Chard & Howe, 134 Maiden Lane, New York. Ask them how it works.

Grindstones—1000 Tuns to select from—Mitchell—Phila.

Grindstones—"How to use them"—Sent free—Mitchell—Phila.

Machinists' Grindstones—J. E. Mitchell, York Ave.—Phila.

Sign Factory—The largest Metal Sign Factory in the world. Orders solicited. Rates low, and work executed with despatch. R. A. Adams, 132 South 5th Avenue, New York.

Wanted—A first class Miller for White Lead Works. Address, with references, &c., White Lead Company, New Britain, Conn.

A Chemist, a practical man, wishes a position; capable of taking charge of some department. Address Chemist, P.O., Box 63, N.Y.

Wanted—The best Shoe Peg Machine made,—also, 2d hand Ward Spoke Lathe. Send description & price to HURD & BRO., Urbana, O.

See Advertisement of Havens' Circular Saw Tables.

Patent Steel Measuring Tapes, manufactured by W. H. Paine, 116 Freeman St., Greenpoint, N.Y. Send for Circular.

Walrus Leather, for Polishing Steel, Brass, and and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

Repertory of Arts.—For sale, a complete set of the Repertory of Arts, handsomely bound, half calf, uniform size, with general indices comprising five series and 113 volumes. Perfect in every respect. Embracing Inventions, Discoveries, and Improvements in Arts, Manufactures and Agriculture, with Engravings—from 1795 down to 1856. Apply to MUNN & Co., office of the SCIENTIFIC AMERICAN.

Turkey Boxwood pieces for Sale, suitable for engravers and fancy turners' use. Address Stephens & Co., Riverton, Conn.

Manufacturers of Steam Pumps will please send Descriptive Circulars and Price Lists to Joseph Capps & Sons, Jacksonville, Ill.

Patent Felt Floor Carpeting. C. J. Fay, Camden, N. J.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St. Brooklyn. Send for Catalogue.

The best lubricating oil in the world is Winter pressed Sperm. Sold in bottles, cans, and barrels, by Wm. F. Nye, New Bedford, Mass.

Gear Wheel Moulding Machines—Paget's Blocks and Gipsy Winches (English Patent). Hamilton E. Towle, 176 Broadway, New York.

Improved Mode of Graining Wood, pat. July 5, '70, by J. J. Callow, of Cleveland, O., enabling inexperienced grainers ("without the long required study and practice of heretofore") to produce the most beautiful and Natural Graining with unequalled speed and facility. Send stamp for circular.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Wanted—A man who thoroughly understands making malleable iron, and can superintend a foundry. Address M. I. F., Worcester, Mass.

Upright Drills—The best in the world are built by the Hawes Machine Co., Fall River, Mass. Send for circular.

Consolidation—"American Manufacturer and Trade of the West." Pittsburgh. Finest and best paper of its class in the world. Everybody takes it.

Presses, Dies, and all Can Tools—Ferracute Works, Bridgeton, N. J.

Vinegar—how made—of Cider, Wine, or Sorgo, in 10 hours F. Sage, Cromwell, Conn.

Best Oak Tanned Leather and Vulcanized Rubber Belting. Greene, Tweed & Co., 18 Park Place, New York.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 35 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Self-testing Steam Gauge.—The accuracy of this gauge can be tested without removing it from its connection with the boiler. Send circular. E. H. Ashcroft, Boston, Mass.

Ashcroft's Low Water Detector. Thousands in use. Price, $15. Can be applied for less than $1. Send for Circular. E. H. Ashcroft, Boston, Mass.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Superior Belting—The best Philadelphia Oak Tanned Leather Belting is manufactured by C. W. Arny, 301 Cherry Street, Philadelphia.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Blake's Belt Studs. The cheapest and best fastening for Rubber and Leather Belting. Greene, Tweed & Co., 18 Park Place, N.Y.

Bailey's Star Hydrant, best and cheapest in the world. All plumbers send for a circular to G. C. Bailey & Co., Pittsburgh, Pa.

Patent for sale, or Partner wanted with capital to introduce the same. Please address Philip Marquard, 468 Swan st., Buffalo, N. Y.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

Diamond Carbon, of all sizes and shapes furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks. 587 Broadway, New York.

The Greenleaf Grate Bar saves fuel, and lasts much longer than the ordinary bar. Address Greenleaf Machine Works, Indianapolis, Ind.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

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Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

A GENERAL REPLY TO A LARGE NUMBER OF CORRESPONDENTS.—H. says he has a 6 horse power, in connection with a two story building 20 feet square, and wants manufacturing business to occupy his premises.—H. R. G. wants to know the cheapest and best shot gun and rifle combined; also, wants our opinion of the Veeley rifle.—R. D. wants an ice machine.—J. M. S. wants a spoke lathe, wants us to tell him the price, where made, and how much it will do, all at the earliest possible moment.—W. F. F. wants a good work on horseshoeing.—J. H. S. wants a machine that will cut guttapercha into very small pieces with but little trouble.—J. M. desires to purchase a paper bag machine.—W. A. P. wants a shingle machine that cuts with a knife.—F. C. calls for information as to the best manner of setting a boiler 22 feet by 42 inches, with two 16 inch flues; fuel, gas coke.—L. P. asks if any of the concrete or asphalt pavements have proved satisfactory.—J. G. H. asks for reliable parties to sell a patent.—J. M. asks for information about drilling artesian wells, tools required, and the address of parties who make the machinery. Wants the information for a missionary friend who, he says, lives in "Cyria."—W. A. wants to know where he can get a good machine for bending plow handles of oak wood.—T. L. C. asks us to tell him who make wind mills.—G. T. C. asks for a list of trades where an apprentice can get his board and small pay for first year; also, how much powder a No. 11 shot gun, 28 inches long, ought to burn; also, what a small hand printing press with type and outfit costs.—A. J. H. wants the manufacturers address of the toy horse.—W. S. B. asks us to tell him which of the many lightning rods we consider the best.—L. S. wants us to tell him which knitting machine we think is the best.—C. B. asks where to purchase a good telescope.—J. B. B. asks where he can procure an odometer.—C. T. G. wants to know if there is anything better for roofs than charcoal tin; also, if we know the merits of the patent continuous roofing.—J. H. W. calls for the best book of architectural designs for cottages.—M. A. asks about asbestos roofing.—E. L. asks for our opinion, confidentially, about the merits of a corn sheller, and a combination rule instrument.—D. W. A. wants to know who makes the best and latest improved chair making machinery.—A subscriber asks where Stuart's annealed wire is made.—I. J. M., wants the best works on steam engines and boilers; also, on mechanics, agriculture, stock raising, etc.—S. C. C. asks where "Webster's patent zinc metal paint" can be obtained.—F. wants to know if Howard & Co., Waltham Watch agents, are responsible.—E. P. N. wants detailed drawings of the monitor roof cars.—C. & F. want to find parties who supply a pure article of plumbago.—G. C. H. wants the best spring or weight power for churns. . . . . .

The above are *bona fide* enquiries taken at random from hundreds that we are constantly receiving from all parts of the country—mostly from subscribers to the SCIENTIFIC AMERICAN. It is impossible for us to attempt to answer them, either by letter or in our paper. Answers to some of them can be found, if the writers will take the trouble to consult the back pages of the SCIENTIFIC AMERICAN. Manufacturers of the various articles may secure these customers, and obtain others by inserting short advertisements in our paper. For every person who writes us for an article, there are perhaps a hundred others who want the same thing, that do not write to us, but are on the lookout for the proper advertisements. As to the merits of various articles, we cannot undertake to advise our correspondents, but we say to them that, as a general rule, the best goods are those that are advertised in the SCIENTIFIC AMERICAN.

CONDENSATION OF STEAM IN LONG PIPES.—In answer to query of Y. S., in the issue of Sept. 2nd, I would say that I had occasion recently to make a test of the difference in pressure of steam through an inch pipe, 300 feet long, running entirely exposed through an open planing mill. The pressure on the boilers was 76 pounds. The test gage at the other end showed a pressure of 70 pounds, making a difference of 6 pounds. The gage on the boiler had been used over a year, and doubtless showed a little more pressure than there really was.—F. G. C., of Vt.

FALLING BODIES.—The formula given by T. E. N. E. on page 218 of the SCIENTIFIC AMERICAN, in reply to J. E., would make the impact of 1 lb. falling 2 feet appear to be 11·34 foot pounds. Whereas, it has been found by actual observation to be 50 pounds. If J.E. will multiply the weight by the velocity at end of the fall, and the product by 4·426, he will have the true impact.—D. A. M., of N. Y.

SUBSTITUTE FOR BRASS.—In answer to query No. 8, signed F. W., in the SCIENTIFIC AMERICAN of Sept. 2nd, I would say that I have found Williams' Diamond Metal a very good substitute for brass, especially for boxes and other wearing parts of machinery. In appearance it resembles very much the metal called Parson's white brass. It can be melted in a common iron ladle, and will take a very good polish.—D. P. D., of N. Y.

CISTERN.—Let W. H. W. put two ounces of permanganate of potassa in his cistern. It will render the foulest water sweet and pure.—B. F. D., of Neb.

COIL IN BOILER.—I have used the same coil as M. S. M., query 27, Sept. 30, and always had trouble until I placed the check valve between the pump and the coil, since when the coil has always had water.—G. A. Y., of N. Y.

O. S. M., of Va., says: I believe that in the manufacture of white lead, carbonic acid gas is generated, and that the inhalation of this is one of the causes of injury to the health of the workmen employed in its production. Could not this gas be gotten rid of by taking advantage of its weight, and boring holes in the floor to allow its escape?

Answer. Undoubtedly carbonic acid gas would run through holes in the floor of an apartment in which it was generated freely, but it is not carbonic acid that injures workmen in making white lead. It is the absorption of the lead into the system that does the mischief.

M. H. B., of Mass.—The friction of water in a pipe only one-half inch in diameter, and 800 feet long, would be very great, and as you say the water has to be lifted 23 feet, we do not think an atmospheric pump would answer the purpose. A powerful force pump at the lower end of the pipe would probably succeed measurably, but the pipe is of too small diameter for its length. To get a satisfactory delivery, it ought to be one inch in diameter at the least.

J. H. M., of Mo.—The specimens of iron ores sent have every appearance of being valuable for making steel. We advise you to have them subjected to critical examination and assay which will definitely determine their value. You had better get Professor Draper, 429 Lexington avenue, N. Y., or some other competent chemist to make an analysis for you.

H. A. B., of Ill.—We cannot point out your difficulty without knowing the exact method of procedure you adopt. We judge you melt your lead first and then add the tin. Melt the tin first and sprinkle its surface with a little powdered sal ammoniac, then add the lead, and we think you will succeed.

R. A. P.. of Mass.—You will find a complete series of articles on beet sugar making, with illustrations, in Vol. XX. of the SCIENTIFIC AMERICAN.

H. H. V. L., of N. Y.—You can use melted lead for drawing the temper of the small steel articles you refer to.

S. & S., of Miss.—The internal pressure in the bottom of the shell of a steam boiler is not less than on the top.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

AMERICAN INSTITUTE FAIR.—G. F. D.
BOILER EXPLOSIONS.—D. E. H.—F. L.—J. C.
CANAL BOATS.—S. H.
MARINE GOVERNORS.—T. S.
RAILWAY BRAKES.—W. L.
TENSILE STRENGTH OF IRON.—M. D. C.
THE EARTH'S MOTION.—J. B.
THE MODALITY OF THOUGHT.—A. S. G.
VICES.—W. J. W.
ANSWERS TO CORRESPONDENTS.—F. F. P.—J. A.—M. M.
QUERIES.—A. L. S.—C. C. C.—F. D.—S. E. J.

NEW BOOKS AND PUBLICATIONS.

THE COACH MAKER'S INTERNATIONAL JOURNAL. Edited and published by Mr. I. D. Ware, 411 Chestnut street, Philadelphia, Pa.

This No. of the Journal commences its seventh volume with a new suit of type throughout, and makes a decidedly elegant appearance. It is one of the best of the special trade publications, and has our best wishes for its future success,

CAPTAIN ALSTEN'S SEAMANSHIP. New Edition. Revised and enlarged by Commander R. H. Harris, R. N. With a Treatise on Nautical Surveying by Staff-Commander May, F.R.G.S. Also, Instructions for Officers of the Merchant Service, by W. H. Rosser. With Two Hundred Illustrations. New York: Wiley & Son.

To any who wish to become learned in nautical lore, this book will prove just the help requisite for the purpose. To those who intend to follow the profession of a seaman, it would seem to be a very valuable work, in fact, a complete catechism of seamanship, including even the small but important particulars which are essential to complete accomplishment in any profession, but the lack of which in a seaman immediately stamps him as a "lubber." The revision of the work has adapted it to modern improvements in the build and rig of vessels; and, though the work is written with special reference to English ships, it cannot fail to be useful to American seamen.

THE CARRIAGE PAINTER'S ILLUSTRATED MANUAL: Containing a Treatise on the Art, Science, and Mystery of Coach, Carriage, and Car Painting. Including the Improvements in Fine Gilding, Bronzing, Staining, Varnishing, Polishing, Copying, Lettering, Scrolling, and Ornamenting. By F. B. Gardner. 16mo. Cloth. Price $1. New York: S. R. Wells, Publisher.

The character of this work being sufficiently set forth in its title, as above, we have only to add that its practical nature must render it a very useful treatise to painters in general, but more especially to the particular class of painters which the title indicates.

APPLICATIONS FOR EXTENSION OF PATENTS.

MOWING MACHINE.—Silas E. Jackson and Morgan P. Jackson, Boonville N. Y., have petitioned for an extension of the above patent. Day of hearing, December 13, 1871.

LOCOMOTIVE FURNACE.—G. S. Griggs, deceased.—An application has been made for an extension of the above patent. Day of hearing, November 29, 1871.

LOCOMOTIVE ENGINE WHEELS.—G. S. Griggs, deceased.—An application has been made for an extension of the above patent. Day of hearing, December 13, 1871.

INDIA RUBBER DOOR MAT.—Edwin M. Chaffee, Providence, R.I., has petitioned for an extension of the above patent. Day of hearing, January 31, 1872.

SEEDING MACHINE.—William Coggeshall and Bennet B. Warner, Massillon, Ohio, have petitioned for an extension of the above patent. Day of hearing, December 13, 1871.

MACHINE FOR ROLLING CORNICES.—Asa Johnson, New York city, has petitioned for an extension of the above patent. Day of hearing, December 6, 1871.

METHOD OF GOVERNING THE CUT OF CIRCULAR SAWING MACHINERY.—A. C. Martin, Cincinnati, Ohio, and William H. S. Ewell, of same place, administrator of M. M. Wombaugh, deceased, have petitioned for an extension of the above patent. Day of hearing, December 6, 1871.

REAPER AND MOWER.—Thomas I. Stealey, Middletown, West Virginia has petitioned for an extension of the above patent. Day of hearing, November 29, 1871.

BORING MACHINE.—Lafayette Stevens, Elmira, N.Y., has petitioned for an extension of the above patent. Day of hearing, November 29, 1871.

ELECTRO MAGNETIC SPEED GOVERNORS.—George M. Phelps, Brooklyn N.Y., has petitioned for an extension of the above patent. Day of hearing, December 20, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row

Inventions Patented in England by Americans.

September 12 to September 16, 1871, inclusive.
[Compiled from the Commissioners of Patents' Journal.

BRAKE.—G. Westinghouse, Jr. (of Pittsburgh, Pa.), London, England.
RUBBER COATING.—G. T. Chapman (of New York city), London, England.
COTTON, ETC., PRESS.—A. Baldwin. New York city.
DYEING FABRICS.—T. Sampson (of Providence, R. I.), Birmingham, Eng.
ELECTRO-MAGNETIC ENGINE.—E. Gassett, Boston, Mass.
ELECTRO MOTOR.—S. Jones, E. D. Lawrence, New York city.
LAWN MOWER.—G. L. Chadborn, T. Coldwell, Newburg.
SPINNING MACHINE.—S. M., H. M. Williams, D. A. Douglass, Coldwater, Mich,
STUFFING BOX AND PACKING.—E. W. Brown, Boston, Mass.
TELEGRAPH.—G. L. Anders, Boston, and E. B. Welch, Cambridge, Mass.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 10,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

s the closing inquiry in nearly every etter, describing some invention, which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalties must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller, if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of yonr improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

ersons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant or a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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All business committed to our care, and all consultations, are kept *secret and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

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Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

POTATO DIGGER.—To the cranked axle of a hand cart is pivoted the bent handle of a fork or digger. The cart box is divided longitudinally in the middle, so that the cranked part of the axle has play between the two sections. In using the machine the cart is drawn along over the rows, and when in proper position over a hill of potatoes, the operator holds it fast by pressing the handles down upon the earth, thereby pressing spikes, which project from the handles, down into the soil; he then seizes the handle of the fork or digger, and draws it forward till the cranked portion of the axle is in a horizontal position. He then raises the handle into a vertical position, and plunges the tines of the fork down into the earth. Then, using the handle as a lever,he raises the mingled earth and roots, and separating the earth by a few shakes, tosses the potatoes into the cart box, and so proceeds from one hill to another along the row. Mr. Franklin Jones, of Terre Haute, Ill., is the inventor of this mathine.

MEDICAL COMPOUND OR LINIMENT FOR RHEUMATISM.—John W. Helms, of Bainbridge, Ga.—This is an improved liniment for rheumatism, neuralgia, toothache, sprains, bruises, paralysis, etc.; and it consists of the liniment prepared of various ingredients in a peculiar manner.

LEADER PIPE COUPLING.—John Demarest, of Mott Haven, N. Y., assignor to himself and Jordan L. Mott, of same place. This is a new method of arranging couplings or brackets for holding cast iron leader pipes upon houses. It consists in a cast metal coupling having a suitable hole through it vertically for the pipe, and made in two parts, one of which, being attached to the building, has the other attached to it so that it may be readily taken off at any time for repairing the pipe or putting in a new section, and admit of doing this without disturbing the other sections or taking them down, as has to be done with the present mode of fastening the leader pipe. Besides having the advantage stated in regard to putting up and taking down the pipe, the arrangement of the coupling is simple and economical as to the quantity of metal used, and presents a neat and symmetrical appearance.

CURTAIN FIXTURE.—Joshua D. Legg, of Long Eddy, N. Y.—The roller is arranged to be revolved and held in position in the same manner as the ordinary curtain roller. Tapes are attached to the roller at one end, and to the lower end of the curtain at the other end. Two other tapes are attached to the roller and to the top or other end of the curtain. These tapes are so attached to the roller that when one pair is being wound around the roller the other pair will unwind, as, for instance, when letting down the top and raising the bottom of the curtain, and *vice versa*. By this arrangement the curtain may be dropped down, so as to cover the lower half of the window, or raised up so as to cover the upper half, or extended over the entire window, or be rolled up around the roller, as may be desired.

GANG PLOW.—This is a combination of various devices to form an improvement upon a plow patented July 27, 1869, by Hoell B. Smith, of Tremont, Ill., the same inventor being the author and patentee of the present improvement, which consists of certain peculiarities of construction, whereby, in three horse plows, the middle horse can walk in the furrow; and also in supplying a guard to hold the plow beams and sustain lateral strain.

MEDICAL COMPOUND OR LINIMENT.—Thomas B. Randell, of New York city.—This is a new mixture for the cure of rheumatism, neuralgia, lumbago, bruises, sprained swollen joints, pain in the chest, and other similar diseases and affections. This liniment is rubbed into the skin as near as convenient to the parts affected. The phosphorus it contains is claimed to enter the osseous structure, and give strength and vigor to the same, asafetida aiding in its ready absortion by the system.

SAWING MACHINE.—Christian O. Hansen, of Ferguson, Mo.—This invention consists in the adaptation of a rotary sawing machine to the employment of the saw mandrel as the driving shaft of a scroll saw, the power being applied by the saw driving gear, and the scroll saw and its adjuncts being detachably connected to the sawing machine to admit of adjusting it either for scroll or circular sawing, or for other work. The saw frame may be adjusted for employing the mandrel as the spindle of a tenoning lathe; also for the application of a boring and planing mandrel, and also for the application of a turning lathe attachment, and boring attachments.

DRILL CHUCK.—Pompeius Philippi, of Beardstown, Ill.—This invention relates to a new way of giving end play to drill bits while in the act of being centered and thereafter; and consists in allowing a slight but constant lateral play to the chuck, within which the shank of the bit is made fast. By means of a flanged plate or cap the chuck is secured to the end of the mandrel by screws. The end of the mandrel is provided with a hemispherical cavity, which the end of the chuck is made to fit. The globular end of the chuck not only fills the cavity in the end of the mandrel, but extends out from it, and is of greater diameter than the socket portion of the chuck. The cap is made to slip over the socket portion of the chuck, and to fit a portion of a ball, so that, when it is screwed up to the flange on the end of the mandrel, or secured in its proper position, the chuck will be held to the mandrel, but not tightly, the globe or ball being allowed to turn, so that the point of the drill will adjust itself to the center. A pin or lug on one side of the ball, is placed in a recess formed in the cap and mandrel, by means of which the chuck is carried round with the mandrel.

COTTON GIN ATTACHMENT.—Hiram P. Harrell, of Roxobel, N. C.—This invention is an attachment to cotton gins for crushing the cotton seed as it discharged from the breast of the gin. It consists in attaching rollers to the gin, arranged so as to receive the seed and crush it as it leaves the breast of the gin. These crushing rollers are revolved, either by means of the driving belt of the gin, or in any other suitable manner. Gear wheels on the shafts of the rollers, cause them to revolve with a uniform motion. The inventor does not confine himself to any particular mode of supporting or driving the crushing rollers; but connects them with the gin so that the seed will be crushed thereby as it drops from the breast of the gin. Aprons or guides are used for conducting the seed to and from the rollers; and scrapers are arranged to constantly clean the rollers, should the crushed seed and oil adhere to them.

HORSE HAY FORK.—Jacob H. Carothers, of Pine Grove Mills, Pa.—This invention is an improvement in horse hay forks, of the class in which a lever or link is employed for causing the prongs or teeth to clamp or compress the hay between them. It consists in a peculiar construction and arrangement of parts, whereby a very compact and apparently efficient implement is secured.

MACHINE FOR PULPING WOOD FOR PAPER STOCK, ETC.—Benjamin F. Barker, of Curtisville, Mass.—This invention relates to improvements in machinery for converting wood into pulp for use in the production of paper, and has for its object to insure the proper action of all parts, and simplify their construction and the arrangement of driving mechanism. It consists in a new form of stone, whereby centrifugal force is utilized for retaining the wood in contact with the grinding surface a longer time than it otherwise would remain. The invention also consists in the use of adjustable guides, whereby the blocks of wood are held to and caused to be fed against the grinding surface in the desired manner. There is also an attachment for grinding splinters and small pieces apart from the larger blocks, but on the same stone and in a new general combination of parts for the purpose specified.

WINDMILL.—Isaac Lehmer, of Lima, Ind.—This invention has for its object to furnish a simple and effective means for making the fans or wings of a windmill self adjusting, so that they will adjust themselves as the wind varies in force, by turning their edges more or less to the wind, as may be required. It consists in the construction and combination of rods, a spring, and a sliding wheel with the wings or fans and with the shaft, in such a way that as the movement of the fans or wings increases in rapidity, the centrifugal force thus engendered moves the fans or wings outward, which turns the edges of said fans or wings toward the wind, thus checking their movement. As the velocity of the movement decreases, the springs draw the fans or wings inward, which exposes more of their side surfaces to the wind, the fans or wings being thus self regulating. The fans or wings may also be adjusted to regulate their movement, or to turn their edges toward the wind, and hus stop them, by moving the sliding wheel.

GATE.—William Hathaway, of Northbridge, Mass.—The hinge post of this gate has a projecting cap piece. The end of the top rail of the gate rests on the cap, and lower rail rests on an ear projecting from the gate post below, and the pintle of the hinge passes through the top rail, cap, bottom rail, and ear. The hinge is formed in this manner, which allows the gate to swing in either direction while supporting it in the most substantial manner. A cap on the latch post has a recess therein for receiving the catch in the end of the top rail. A latch piece receives the slat rail next to the top. This passes through a long mortise in the end piece, so that it can be moved up and down therein, and play is given it at the other end, which allows of that motion. This rail is thus arranged for and operates as a latch.

PAD FOR STAIR AND OTHER CARPETS.—Edward H. Bailey, of Brooklyn, N. Y.—This invention consists in excluding moths and noxious insects from carpets by means of a pad formed of one or more layers or sheets of paper, surrounded by cotton batting or wadding, and a bag or outer case of cotton, linen, or other suitable cloth or material, the case being tightly sewed up so as to inclose the batting. The paper is impregnated with the essence of oil of sandal wood, or with the essence of oil of cedar, for rendering not only the pad but the carpet under which the pad is placed moth and insect proof; the odor of the wood will permeate the carpet, and render it moth, worm, and insect proof.

CUTTING APPARATUS FOR HARVESTERS.—Marshall Harrison, of Laclede, Mo., assignor to himself and Jefferson Mize, of same place.—In this invention the rear ends of the movable cutters are pivoted to a supplementary spacing bar. The object of this is to connect the series of cutters in such a manner that, if either one of the pivots by which they are connected to the sliding bar and stationary rib should give way, the operation of the tooth will not be prevented but allowed to go on as usual. In this way many of the usual stoppages in cutting, by which all the hands that follow the harvester are delayed in their work, are entirely obviated.

CLAMP FOR MAKING PICTURE FRAMES.—Leonard A. Johnson, of Candor, N. Y., assignor to himself and John O. Frost, of same place.—This invention relates to a new machine for holding the pieces of a picture frame in place while the joints are being cut by a saw, and, subsequent to such sawing, for holding the glued pieces in close contact. To the top of the frame of the machine are pivoted four oblong slotted frames or plates, whose pivot pins project from them into apertures of the table, and to which are attached corner blocks or followers, each of which has a button projecting from its lower face into the slot of the plate, wherein it can slide but not work up and down, being held in place by a projecting rib, or countersunk in said plate. Above the plate, each cornerpiece constitutes a block with a rectangular recess in one edge. The blocks are held by ropes or cords that pass through a central aperture of the table, connected with a block under the table top. A short cord connects this block with a lever or treadle, which can be set higher or lower at either end. The pieces which are to constitute one picture frame, are held in place by the corner blocks or followers which are drawn against the jointed ends of the pieces, by the cords drawn down by means of the lever. The joints are then cut by means of a fine saw, which is guided in a slit of each block, to work in the desired angle. The ropes are so adjusted that they make the picture frame square at every angle, the confining blocks being self adjustable. There is a projection on one side of every block for the back of the saw to rest on, to prevent the saw from cutting deeper than just through the frame. After the joints are in this manner completed, the pieces are removed and properly glued, and then replaced in the machine, and firmly held together by means of the lever; the frame can then be finished. The ropes are not in line with the miters of the picture frame, but all meet at a common center, so that the strain will be equal on each side of the corner of the frame, the sides being of different lengths. If the frame is made equilateral, the ropes will also be in line with the miters. The table has several apertures for permitting the adjustment of the plates to the holding of larger or smaller picture frames.

CARPENTER'S PLANE.—Henry N. Frederick, of Hancock, N. Y.—The face of the planing iron has a toothed portion, into which mesh the teeth of a segment. This segment is formed at the lower end of a lever, that turns on a pin whose bearings are in the sides of the plane. By swinging the lever on its pivot, the iron will be set up or down, as may be desired. A slotted lever pivoted to the plane can be clamped by means of a thumb screw to lock the iron in any suitable position. Other means for thus securing the lever and iron, may, however, be substituted for lever and screw.

LUBRICATOR FOR PICKER SPINDLE IN LOOM.—Thomas Parker, of Shelby, N. C.—This invention consists in a new way of applying lubricating material to a picker spindle. A wick is confined in a tubular screw, inserted into the top of the picker. The upper portion of the tube is enlarged, forming a cup, which allows the upper portion of the wick to spread and absorb oil. The lower portion of the wick is more compressed; but not so much so as to prevent a sufficient quantity of oil from passing through it for lubricating the spindle with which it is in contact. As the picker is thrown by the picker staff over the spindle at each throw of the shuttle, the spindle will be constantly lubricated when there is oil or other lubricating liquid in the wick.

TUBE EXPANDER.—Charles H. Clark, of Laramie, Wyoming Ter.—A central feed screw or roll is made tapering, from its forward to its rear end. The thread of the screw is made wide, strong, and with parallel sides, and has a shallow groove formed in its center to receive the bead of the small rollers, placed in slots in a cylindrical frame, with their faces resting against the screw. The rollers are perforated longitudinally to receive a wire, the ends of which enter notches in the frame, where they are secured in place by open spring rings, placed in grooves in the outer surface of the said frame. This construction allows the wires to be conveniently removed, and the ends of the rollers ground off to receive the longitudinal extension caused by the great side pressure to which they are exposed when in operation, and which would soon cause them to bind in the frame. Upon one, two, or more of the rollers is formed a bead, in such a position as to form a bead in the tube at the water side of the tube sheet. The bead at the end of the tube is formed by concave rollers pivoted to a ring, which, when at work, rest upon the edge of another ring upon the rear part of the tubular frame, which is prevented from turning by a tongue and groove. This ring is forced forward to feed the rollers to their work by a nut which fits upon a screw thread cut upon the rear part of the frame. The screw thread cut upon the inner surface of the tubular frame is made deep, so as to mesh into the thread of the screw or roll, even at the smallest part of the screw.

AUTOMATIC TRAP FOR WASH BOILERS.—Henry R. Robbins, Baltimore, Md.—This invention consists in a device intended to be placed on the bottom of a wash boiler, and operating to gather up water under steam pressure and to conduct it upward through a vertical pipe having an elbow at its top from which the water is ejected with much force and played in a stream within the boiler, upon the clothes, thereby assisting materially in cleansing the same.

COTTON CULTIVATOR.—Richard H. Purnelle, Beulah, Miss.—This invention consists in the combination, in one mechanism, of a barring off mechanism, a scraping mechanism, a cutting out mechanism for bringing the plants to stands, and a throwing on mechanism for heaping soil upon the stands.

COMBINED PLOW AND STOCK FOR CULTIVATORS.—Martin Kennedy, Chicago, Ill.—This invention relates principally to a stock so constructed as to receive different implements, such as a share and mold board for a single plow; two mold boards, one on each side, both constituting a double plow two beams armed with shovels and constituting a cultivator; and a point to be used when the double mold boards and cultivators are employed.

EGG PACKING BOX.—Nathan L. Janney, Wilmington, Del.—This invention relates to packing eggs held in little bags, which depend from perforated shelves, which shelves are supported horizontally in a box at suitable distances one above another by means of a partition whose ends enter vertical grooves in the sides of the box, the eggs supported in each shelf being covered with a piece of cloth which extends beneath the bottoms of the aforesaid partitions.

WHEEL CULTIVATOR.—John A. Viars, of Sherman, Texas.—This invention relates to a new and useful improvement in agricultural implements; and consists in a construction, arrangement and combination of parts whereby the plows or teeth may be raised or lowered, or made to penetrate the ground as much or little as may be desired. One or more plows may be used at one and the same time, arranged in any manner, so as to be raised and lowered. Pivot wheels or casters allow the machine to be turned in the field at pleasure.

APPARATUS FOR UTILIZING WASTE HEAT.—Ben James Hobson, Covington, Ky.—The invention consists in a peculiarly advantageous arrangement of two supplementary drums, connecting tubes, and entrance and exit flues in an enclosing or main drum, whereby a maximum area of heating surface is provided within a given space.

FLOOR CLAMP.—Thomas S. Urie, of Hubbardston, assignor to himself and George H. Cagwin, of Carson City, Mich.—Two bent bars are pivoted together so that they resemble in form a horse shoe, jointed in the middle of the bend. To one of the sections or bent bars is attached a gripping device, which seizes the beam or joist, and the other bar is forced against the floor board, to be clamped by means of a lever and toggles.

DITCHING MACHINE.—David Whitesell, of Mattoon, Ill.—Wheels, provided with disks having annular cutting edges on their peripheries, cut the sides of the ditch. A double mold board plow, having horizontal cutting edges, extends out to a point in line with the disk cutters. A rotary cutter, placed between the two sides of the mold board, cuts through the grass sod of the furrow slice and divides it into two equal parts. These three instrumentalities cut the soil at all necessary points. Auxiliary mold boards, for receiving the soil from the double mold board and forcing it outwardly beyond the sides of the ditch, are employed. These are hinged, by arms, to a standard, rigidly attached to the beam. By suitable mechanism, the mold boards are lifted from the ground, and the point of the plow is raised when desired.

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119,444.—CART.—O. Benson, J. G. Falk, Chicago, Ill.
119,445.—DIE.—J. Carroll, Oakland, Cal.
119,446.—COUPLING.—J. Childs, West Troy, N. Y.
119,447.—PINCERS.—A. Clarke, Boston, Mass.
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119,449.—CAP BLOCK. R.Cook,T. Hanford,New Hartford,N.Y.
119,450.—STRAP.—H. Cornell,A. H.Marshall,Wilmington,Del
119,451.—PLATE GLASS.—E. Cossaboom, Lenox, Mass.
119,452.—SHEARS.—J. F. Creighton, Placerville, Cal.
119,453.—REFRIGERATOR.—H. Davis, R. Alden, Erie, Pa
119,454.—WATER GAGE.—M. Doyle, Baltimore, Md.
119,455.—GAS LAMP.—G. S. Dunbar, Pittsfield, Mass.
119,456.—SIGNAL.—G. F. Folsom, Boston, Mass.
119,457.—SASH HOLDER, ETC.—L. Gathmann, Chicago, Ill.
119,458.—ORGAN VALVES, ETC.—C. D.Goodman, Cleveland, O
119,459.—LOOM HARNESS.—R. B. Goodyear,Wilmington, Del
119,460.—CLARIFYING WINES.—A. Gottschalk, Napa, Cal.
119,461.—POTATO DIGGER.—I. Hicks, Hartford, Wis.
119,462.—SAW SET.—D. Jones, Allegheny, Pa.
119,463.—KING BOLT, ETC.—J. A. Judd, Newton, Mass.
119,464.—PAPER PULP.—M. L. Keen, Jersey City, N. J.
119,465.—PAPER PULP.—M. L. Keen, Jersey City, N. J.
119,466.—BRIDGE.—L. Kittinger, Massillon, Ohio.
119,467.—CORN PLANTER.—J. Knull,J. P. Pence,St. Paris, O.
119,468.—MEDICAL COMPOUND.—J. McKee,New Orleans, La.
119,469.—GRINDING ROCK.—W. J. Menzies, St. Helens, Eng.
119,470.—CORN PLANTER.—N. B. Moody, Woodman, Wis.
119,471.—SAD IRON, ETC.—F. Myers, New York city.
119,472.—CIDER MILL.—N. A. Patterson, Knoxville, Tenn
119,473.—HEEL.—A. T. Perrine, Boston, Mass.
119,474.—FIRE ARM.—G. R. Pierce, Grand Rapids, Mich.
119,475.—COUPLING.—S. D. Pratt, Penn Yan, N. Y.
119,476.—PAVING.—H. Saunders, Chester, Pa.
119,477.—WATER WHEEL.—H. Shears, Merton, Wis.
119,478.—GAS BURNER.—G. E. Smith, New York city.
119,479.—SHUTTER FASTENER.—J. F. Smith, Boston, Mass
119,480.—GAS BURNER.—W. B. Stofer, Memphis, Tenn.
119,481.—MOTH PROTECTOR.—F. F. Voigt, New Orleans, La.
119,482.—PUMP.—W. H. Ward, Auburn, N. Y.
119,483.—STEAM ENGINE.—W. H. Ward, Auburn, N. Y.
119,484.—STEAM ENGINE.—W, H. Ward, Auburn, N. Y.
119,485.—GRAPE PICKER.—G. A. Warner, San Francisco,Cal
119,486.—TWISTING BARS. A. D. Williams, London, England
119,487.—BED BOTTOM.—G. Wilson, Chicago, Ill.
119,488.—VESSEL.—A. Wingard, San Francisco, Cal.
119,489.—WASH BOILER.—E. M. Wright, Geneva, N. Y.
119,490.—GOVERNOR.—G. Aab, Brooklyn, N. Y.
119,491.—LATCH.—H. D. Alderfer, Grater's Ford, Pa.
119,492.—GAS LIGHT. A. N. Allen,R. H. Dewey,Pittsfield, Ms
119,493.—GRAIN DRYER.—S. V. Appleby, Spotswood, N. J.
119,494.—COUPLING.—S. Barnum, Whitestown, N. Y.
119,495.—GRAIN DRILL.—A. P. Barry, Martinsville, Miss.
119,496.—SEWING MACHINE. A.H. Bartlett, Sptn. Duyvil,N. Y
119,497.—LAMP.—W. W. Batchelder. Boston, Mass.
119,498.—BRONZING MACHINE.—E. F. Benton, Buffalo, N. Y
119,499.—TURN BUTTON.—P. Bradford, New Haven, Conn.
119,500.—BLOWER STAND.—P. Bradford, New Haven, Conn
119,501.—KETTLE.—F. M. Brignac, St. James, La.
119,502.—PLOW CLEVIS.—J. Brison, Competine, Iowa.
119,503.—DISCHARGING COLOR. B. G. Brooks,Manchester,N.H.
119,504.—SHAFT, ETC.—B. G. Brooks, Manchester, N. H.
119,505.—REGULATOR.—A. S. Cameron, New York city.
119,506.—EXTRACTING CAPS.—W. Clews, Ilion, N. Y.
119,507.—STRETCHER.—J. D. Crocker,J. A.Brand,Norwich,Ct.
119,508.—REFRIGERATOR.—D. Cromwell, St. Louis, Mo.
119,509.—GATE.—S. A. Darrach, Newburg, N. Y.
119,510.—WASH BOILER.—W. J. Dodge, New York city.
119,511.—WHEEL.—H. E. Dodson, West Liberty, Ohio.
119,512.—SHAVING HORSES.—F. J. Eldred, Webster, N. Y

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119,513.—SCOURING SKINS, ETC.—E. Fitzhenry, Boston, Mass.
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119,515.—DESK, ETC.—T. Gregg, Danville, Pa.
119,516.—CHUCK.—J. L. Hayden, Haydenville, Mass.
119,517.—SCROLL SAW.—I. Hird, Cincinnati, Ohio.
119,518.—LANTERN.—J. J. Hull, J. Kaufman, Brooklyn, N. Y.
119,519.—PAVEMENT.—S. H. Ingersoll, New York city.
119,520.—RAIL CHAIR.—C. E. Jarvis, Grafton, W. Va.
119,521.—TAPERING FORMS.—H. Kellogg, Milford, Conn.
119,522.—ALARM.—J. Kirk, London, England.
119,523.—CHILD'S CARRIAGE.—J. G. Krieger, Washington, D. C.
119,524.—WAGON BRAKE.—C. M. Lufkin, Unity, N. H.
119,525.—POLISHING NEEDLES.—F. W. Mallett, New Haven, Ct.
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119,527.—RAISING WEIGHTS, ETC.—T. Moore, Stockton, Eng.
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119,543.—THERMOMETER.—G. M. Sternberg, New York city.
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119,550.—ROSE HEAD.—W. Westlake, Chicago, Ill.
119,551.—MILLSTONE.—J. I. Yount, Tippecanoe, Ohio.
119,552.—LATCH.—J. H. Allison, Charlottesville, Ind.
119,553.—VEGETABLE CUTTER.—H. Baldwin, Nashua, N. H.
119,554.—HOT AIR FURNACE.—J. C. Barnes, Albany, N. Y.
119,555.—SEWING MACHINE. A. H. Bartlett, Spuyten Duyvil, N. Y
119,556.—BACK BAND HOOK.—H. Beagle, Jr., Philadelphia, Pa.
119,557.—HUB AND SPOKE.—W. Beauchamp, Grayville, Ill.
119,558.—TURBINE.—A. Bee, Lancaster, Mass.
119,559.—MILK CAN.—T. M. Bell, New York city.
119,560.—CARRIAGE SPRING.—O. E. Bennett, Cannonsville, N. Y.
119,561.—LIGHTING GAS JETS.—A. L. Bogart, New York city.
119,662.—BOILER FURNACE.—E. Boileau, St. Louis, Mo.
119,563.—LABEL, ETC.—T. W. Bracher, New York city.
119,564.—SPRING, ETC.—G. A. Brown, Reading, Mich.
119,565.—SCREW CUTTER.—G. W. Brown, A. T. Gifford, Prov., R. I.
119,566.—NAVAL RAM.—W. Brown, Portsmouth, England.
119,567.—WATER WHEEL.—O. Bryant, Chesterfield, Mass.
119,568.—CURTAIN.—W. N. Bulkley, Brooklyn, N. Y.
119,569.—BREAD CUTTER.—I. S. Bunnell, Carbondale, Pa.
119,570.—CROZE, ETC.—A. Busenger, Mount Solon, Va.
119,571.—STOVE PIPE.—C. A. Buttles, Milwaukee, Wis.
119,572.—ELEVATOR.—P. Byrne, Nashville, Tenn.
119,573.—BALING PRESS.—N. Chapman, Hopedale, Mass.
119,574.—ELEVATOR.—J. C. Clifford, Yonkers, N. Y.
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119,584.—RUDDER.—A. De Man, Ghent, Belgium.
119,585.—HAME, ETC.—A. Dunbar, Woodstock, Canada.
119,586.—GAS RETORT.—H. H. Edgerton, Fort Wayne, Ind.
119,587.—HORSE POWER.—C. M. Erwin, Winona, Miss.
119,588.—CULTIVATOR.—C. Escudier, Iberia, La.
119,589.—SEWING MACHINE.—E. M. Estabrook, New York city.
119,590.—VALVE GEAR.—T. E. Evans, W. R. Thomas, and J. Hunt, Catasauqua, Pa.
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119,592.—ANIMAL TRAP.—T. Fell, New York city.
119,593.—TURN TABLE.—C. H. Fisher, Albany, N. Y.
119,594.—ANIMAL TRAP.—H. Foust, Mill Village, Pa.
119,595.—TURN TABLE.—G. French, Alexandria, Va.
119,596.—WRENCH.—J. Gates, Portland, Oregon.
119,597.—SURFACE BLOW.—J. Gates, Portland, Oregon.
119,598.—RAT TRAP, ETC.—L. F. George, San Francisco, Cal.
119,599.—BANK NOTE.—J. Gibson, Jr., Albany, N. Y.
119,600.—BED BOTTOM.—S. Gissinger, Pittsburgh, Pa.
119,601.—PIPES, ETC.—J. K. Griffin, Waterdown, Canada.
119,602.—BED BOTTOM.—G. C. Grut, Chicago, Ill.
119,603.—COMPOSITION BOX.—T. B. Gunning, New York city.
119,604.—PAPER WASHER.—E. S. Hanna, Pittsburgh, Pa.
119,605.—FURNACE.—C. J. Harris, Bloomington, Ill.
119,606.—CASTER.—W. D. Hatch, Antrim, N. H.
119,607.—PAVEMENT.—J. M. Hawes, Covington, Ky.
119,608.—SCARF HOLDER.—J. Hayden, W. H. Hart, Jr., Phila., Pa.
119,609.—STOVEPIPE DRUM.—B. J. Hobson, Covington, Ky.
119,610.—EARTH CLOSET.—C. D. Holmes, Boston, Mass.
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119,613.—EGG PACKING BOX.—N. L. Janney, Wilmington, Del.
119,614.—FENCE.—A. Jewett, Sanford's Corners, N. Y.
119,615.—PLASTERING.—J. John, Chicago, Ill.
119,616.—COUPLING.—E. D. Johnson, E. A. Cowan, Thorntown, Ind.
119,617.—MOVEMENT.—D. E. Keating, Oswego Falls, N. Y.
119,618.—PLOW, ETC.—M. Kennedy, Chicago, Ill.
119,619.—HAY FORK.—J. C. Lampman, Baltimore, Md.
119,620.—MEDICAL COMPOUND.—J. E. Larkin, Newark, N. J.
119,621.—PIPE ELBOW.—I. Leas, W. H. France, Terre Haute, Ind.
119,622.—ELECTROTYPING.—W. A. Leggo, Montreal, Canada.
119,623.—TELEGRAPH.—L. T. Lindsey, H. H. Curtiss, Jackson, Mich.
119,624.—RAIL CHAIR.—A. P. Lord, Friendship, N. Y.
119,625.—BLIND SLAT.—H. B. Lum, Sandusky, Ohio.
119,626.—SIEVE.—J. A. Maloney, Georgetown, D. C.
119,627.—HAY RACK.—J. Mandigo, Wayland, Mich.
119,628.—GROUND MARKER, ETC.—G. W. Martin, W. G. Parrish, J. A. Petrie, Elizabeth, N. J.
119,629.—WASHING MACHINE.—W. Martin, Orford, Iowa.
119,930.—ROCKET.—C. E. Masten, Boston, Mass.
119,631.—PAPER BOX.—C. A. Maxfield, New York city.
119,632.—CUTTER HEAD.—C. E. McBeth, Hamilton, Ohio.
119,633.—DITCHING MACHINE.—J. W. Metz, Stout's, Ohio.
119,634.—STOVE.—J. D. Miller, Detroit, Mich.
119,635.—ELEVATOR.—C. E. Moore, Boston, Mass.
119,636.—WRINGER ROLL.—J. Moulton, Boston, Mass.
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119,651.—NEEDLE.—S. H. Roper, Boston, Mass.
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119,653.—CIGAR MOLD, ETC.—J. Ryan, Detroit, Mich.
119,654.—CORN HUSKER.—D. Sager, New York city.
119,655.—WAGON BRAKE.—H. Sager, Penn Station, Pa.
119,656.—SCREW DRIVER.—G. W. Schofield, of the U. S. Army.
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119,658.—VISE.—J. Simpson, Cleveland, Ohio.
119,659.—CURRY COMB, ETC.—H. C. Smith, Coxsackie, N. Y.
119,660.—SLEIGH.—H. Smith, West Gray, Me.
119,661.—GATE.—S. Smyth, East Bridgewater, Pa.
119,662.—HORSE HOLDER.—H. A. Sprague, Charlotte, Me.
119,663.—GAS MACHINE.—T. G. Springer, Fayette City, Pa.
119,664.—TURBINE.—S. Stevenson, Danville, N. Y.
119,665.—HINGE.—R. H. St. John, Bellefontaine, Ohio.
119,666.—KETTLE.—D Stewart, Phila., Pa.
119,667.—BRICK MOLD.—R. Stuckwisch, Terre Haute, Ind.
119,668.—GRAIN BINDER.—M. Summers, S. B. Lane, Zionsville, Ind.
119,669.—HAY RAKE.—G. Sweet, Dansville, N. Y.
119,670.—FENCE.—J. D. Tifft, Cuyahoga Falls, Ohio.
119,671.—WATER METER.—D. L. Tower, New York city.
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REISSUES.

4,573.—MILK COOLER.—A. E. Baldwin, Newark, N. J.—Patent No. 93,583, dated August 10, 1869.
4,574.—CLOTHES WRINGER.—C. A. Cummings, F. M. Swallow, Worcester, Mass.—Patent No. 34,395, dated February 11, 1862.
4,575.—STEAMING CLOTH.—L. M. Heery, Hinsdale, Mass.—Patent No. 115,200, dated May 23, 1871.
4,576.—BOBBIN WINDER.—C. H. Palmer, New York city.—Patent No. 105,363, dated July 12, 1870.
4,577.—BINDING BOOKS.—J. L. Rile, New York city.—Patent No. 115,896, dated June 13, 1871.
4,578.—EXTRACTING OIL, ETC.—L. S. Robbins, Rye, N. Y.—Patent No. 75,980, dated March 24, 1868.

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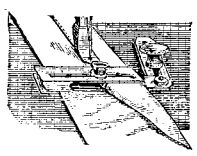

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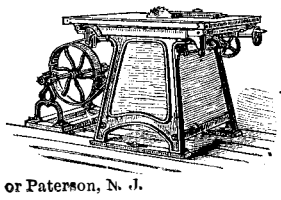

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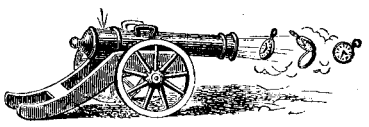

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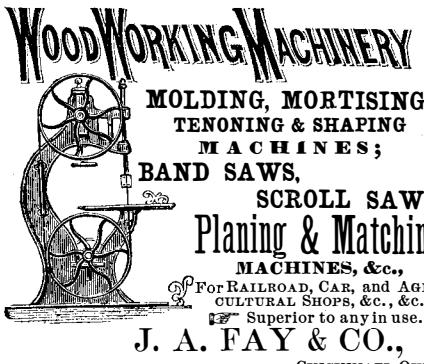

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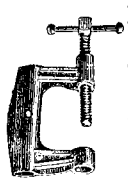

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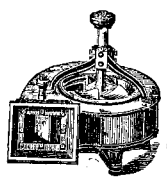

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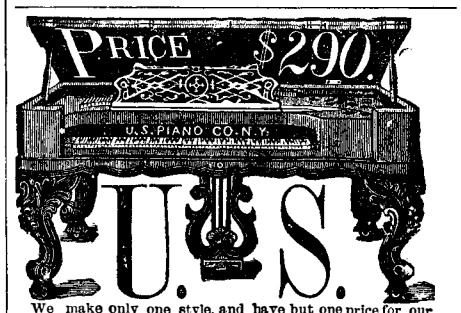

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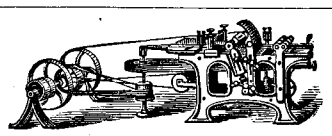

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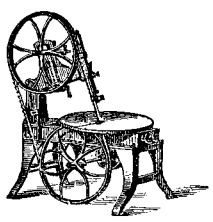

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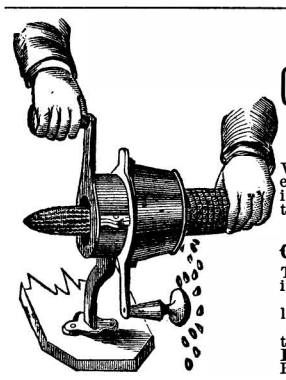

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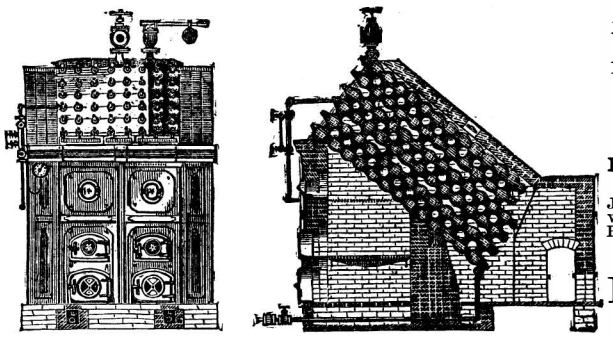

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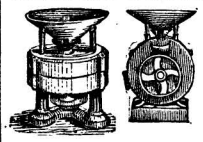

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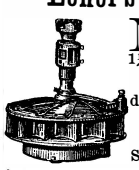

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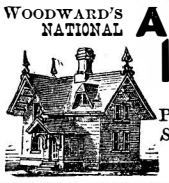

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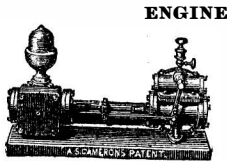

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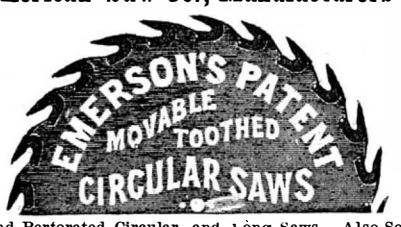

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